# Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

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12(9)

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Washington D.C.

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FRED A. SEATON, SECRETARY

FISH AND WILDLIFE SERVICE
ARNIE J. SUOMELA, COMMISSIONER

# Commercial Fisheries Abstracts

DIVISION OF INDUSTRIAL RESEARCH AND SERVICES
BUREAU OF COMMERCIAL FISHERIES

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0 General and theoretical
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8 Composition
9 Miscellaneous

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**Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.**

0.32 PROTEINS IN FISH MUSCLE. 15. NOTE ON THE PREPARATION OF ACTIN FROM COD MUSCLE WITH POTASSIUM IODIDE

Dingle, J. R. (Fisheries Research Board of Canada, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 16, 243-245 (March 1959)

Introduction. --A convenient procedure for the preparation of actin from rabbit muscle and also from extracted rabbit actomyosin was described by Szent-Gyorgyi in 1951. The procedure was based upon the observation that actin could be reversibly depolymerized by potassium iodide in the presence of a small concentration of adenosinetriphosphate (ATP). In this study, the author used the procedure of Szent-Gyorgyi to prepare fairly pure actin from cod muscle actomyosin.

Experimental. -- All preparative operations were carried out in a room held at 2° to 3° C., and all solutions were precooled to this temperature. Fifty grams of muscle from post-rigor cod (Gadus callarias) was extracted twice in a Waring Blendor with 400 milliliters (ml.) of K-phosphate buffer with an ionic concentration ($\gamma/2$) of 0.05 and a pH of 6.6 to remove the albumins. The residue was then blended for 1 minute with 400 ml. of 0.06 M KCl and K-phosphate to yield a total $\gamma/2$ of 0.08 and a pH of 7.3. This extract was diluted with three volumes of water containing ATP and ascorbic acid (each $10^{-4}$ M), and the resulting precipitate was dissolved in 6 M KI solution containing ATP and ascorbic acid (each $2x10^{-3}$ M) to give a final KI concentration of 0.6 M. After being centrifuged to remove some insoluble material, the supernate was treated with one quarter its volume of 95-percent ethanol and cooled to -40° C. to denature the myosin. The supernate, which still contained some unsedimented precipitate after being centrifuged at 1500 times gravity, was dialyzed against frequent changes of water containing $10^{-4}$ M ATP and ascorbic acid at pH 7.8 to 8.5. After being centrifuged to remove the remaining insoluble protein, the supernate yielded 1.08 grams of protein per 100 grams of fish muscle. The protein was precipitated by adjusting the pH to 4.5 with acetate buffer. Precipitation was 90.5 percent complete, and the product redissolved completely in 5-percent $NaHCO_3$. The

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 ABSTRACTER: Martin Heerdt

0.38 A COMPARATIVE STUDY OF NUCLEOTIDE METABOLISM IN FISH LIVER

Forrest, R. J. and Hansen, R. G. (Michigan State University, East Lansing)
Canadian Journal of Biochemistry and Physiology 37, 751-762 (June 1959)

Introduction. --A study was made of the nucleotides of four species of fish; namely, carp (Cyprinus carpio), catfish (Ictalurus lacustris), sockeye salmon (Oncorhynchus nerka), and silver salmon (Oncorhynchus kisutch). The carp, catfish, and sockeye salmon were taken in fresh water, whereas the silver salmon were taken in salt water. In conjunction with the nucleotide study, the authors were able to demonstrate the presence in fish liver of two of the enzymes involved in uridine diphosphate-glucose metabolism. The results of these studies are the subject of this paper.

Results. --Anion-exchange chromatography was used to separate the acid-soluble nucleotides of the livers of the carp, catfish, and salmon. This technique has produced an elution pattern of nucleotides similar to that obtained from poultry and mammalian liver. Two of the uridine-containing areas eluted from the column have been investigated in detail using enzymatic, chromatographic, and colorimetric techniques. The first of these two adjacent peaks was found to contain N-acetylglucosamine and N-acetylgalactosamine, whereas the second contained glucose and galactose. In both cases, the glucose moiety was the major constituent.

Samples of liver taken from silver salmon were fractionated, and two of the enzymes acting on uridine diphosphate-glucose (UDPG) were identified. The first of these enzymes, UDPG dehydrogenase, was partially purified, and the product of the reaction with UDPG was identified as uridine diphosphate-glucuronic acid. The second enzyme, uridine diphosphate-galactose-4-epimerase, was separated from the dehydrogenase and characterized by using uridine diphosphate-galactose as

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 ABSTRACTER: Martin Heerdt

0.5 BACTERIOLOGY

Anonymous
Food Investigation 1957, Report of the Food Investigation Board (Great Britain), 21-23 (1958) (London)

Flora of fresh and spoiling iced fish. --This study has been extended to codling caught in the waters of the Faroes and the North Cape. The flora of freshly caught Faroe codling appears to be similar to that of North Sea codling but to differ significantly from that of North Cape codling. The predominant flora of North Cape codling consists of: Achromobacter, 51 percent; Coryneforms, 20 percent; and Pseudomonas spp., 9 percent. In North Sea codling, Pseudomonas-Achromobacter spp. are present in about equal numbers and represent over 90 percent of the original flora. During spoilage in ice, however, Pseudomonas spp. gradually emerge as the predominant group, so that after 13 to 17 days of storage in ice, this group accounts for 60 to 80 percent of the total flora alone and for 80 to 90 percent of the total if the Achromobacter spp. are included. In 100 bulk cod landed in Hull, 80 percent of the skin counts isolated at 68° F. fell within $4x10^5$ and $4x10^6$ per square centimeter (sq. cm.), whereas over 70 percent of the flesh counts isolated at 68° F. fell within $6x10^4$ per gram. Counts isolated at 98.6° F. were more scattered.

Examination of 1000 cultures showed that despite differences in the ratios of the different bacterial groups, which depended on whether isolation took place at 32° F. or 68° F. or whether the source was the skin or the flesh, the Achromobacter and Pseudomonas groups always predominated. In isolates made at 98° F. the micrococci predominated, but the total population at this temperature was relatively small.

An examination of 600 swab samples taken from about half the skin area of fish from many different trawlers and different fishing grounds showed over 97 percent with coliform bacteria and over 70 percent with faecal coli. In one batch of 112 swabs, organisms of the Salmonella and Shigella

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 ABSTRACTER: Martin Heerdt

0.6 ANNUAL REPORT OF THE FISHERIES RESEARCH BOARD OF CANADA FOR THE YEARS 1957-1958

Kask, J. L. (Fisheries Research Board of Canada)
Annual Report of the Fisheries Research Board of Canada 1957-1958 for the Fiscal Year Ending March 31, 1958, pp. 13-17 (1958) (Ottawa)

The Technological Station at Halifax continued its investigations into the causes of and the combatting of spoilage of fish in trawlers at sea. Observations on the quality of some 9800 cod and haddock landed during 13 months by eight trawlers indicated that quality seemed to be affected more by the season in which the fish were caught than by the location of the fishing bank. Fish landed during the middle summer and early winter months appeared to be somewhat more susceptible to spoilage than did fish landed during other months. When spoilage occurs, it may be accompanied by the development of characteristic "fruity" odors through the action of certain bacteria on some constituents of the fish muscle. Additional study of (1) the conditions under which such bacteria cause these odors, (2) which flesh constituents are attacked, and (3) the nature of the odoriferous products will shed more light on the course of the spoilage and the effectiveness of antibiotics and other preservatives in delaying it.

The Technological Station at Grande-Riviere continued its investigations with emphasis on problems relating to the production of salt cod. Comparing the relative merits of various salting methods for preparation of light-salted cod indicated that kench salting invites contamination by sliming bacteria because of the large surface of fish exposed; pickle salting gives very good results, but each fish requires individual handling by an experienced salter; brine salting would allow the fastest cure and most uniform product, providing the danger of over-salting the thin parts of the fish can be avoided. Drying tests using the thermocouple control were completed on all types of salted cod with

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ACTIN PREPARED FROM COD

FISH-LIVER NUCLEOTIDE METABOLISM

FLORA OF FISH SPOILAGE

ANNUAL REPORT CANADA 1957-58

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substrate in an enzymatic assay.

0.32

resulting solution exhibited strong birefringence, a characteristic property of F-actin.

Part of this solution was dialyzed against KCl-phosphate with a $\gamma/2$ of 0.4, and a pH of 7.4, and a solution presumably containing F-actin because of its strong birefringence was obtained. The remainder of the solution in $NaHCO_3$ was dialyzed against water to convert the protein irreversibly to G-actin, but some birefringence remained. Conversion was completely by dialysis against KI-phosphate with a $\gamma/2$ of 0.8 and a pH of 7.4, without ATP or ascorbic acid, and then against KCl-phosphate without a $\gamma/2$ of 0.4 and a pH of 7.4. The resulting solution exhibited no birefringence and presumably contained G-actin. When samples of the two solutions were heated at 100° C. for 15 minutes, the protein in the "F-actin" solution precipitated almost completely, whereas the protein in the "G-actin" solution remained clear.

Results.--An electrophoretic pattern was obtained for G-actin in 0.03 M KCl + K-phosphate with a total $\gamma/2$ of 0.4 and a pH of 7.5. The mobilities (X $10^5$ $cm^2$ $volt^{-1}$ $sec^{-1}$) of the main and minor peaks, respectively, were -4.58 and -6.12 ascending and -4.49 and -6.08 descending. The mobility of the main peak agreed with that of the minor peak in an unfractionated KI-extract of cod muscle (Dingle 1958) and also with the mobility of a G-actin prepared from cod by Odense and Dyer, unpublished, according to a modification of the procedure of Tsao and Bailey (1953).

Sedimentation constants for F-actin were 59.6, 28.0, 4.3, and 2.3, respectively, for peaks 1, 2, 3, and 4. Sedimentation constants for G-actin were 4.6 and 2.1, respectively, for peaks 3 and 4. Peaks 1 and 2 were absent in the solution of G-actin. The constant for peak 4 was close to that of cod tropomyosin (Dingle and Odense 1959). Peak 3 probably was due to G-actin; the presence of some of the peak 3 material in the F-actin preparation presumably meant that some of the actin was "inactive" or unable to polymerize.

0.6 (Cross Reference: 1.0111, 9.4)

equal success. This new system permits constant and automatic regulation and allows a light- or heavy-salted product to be made more quickly and of more uniform quality than does the common practice of drying in the open air.

Continued experiments with new products, notably dried pressed "slabs" of shredded fish flesh incorporating 5 to 6 percent salt, indicated that the salt was preferably added dry instead of by a strong brine and that while a slab $\frac{1}{2}$-inch thick could be dried very rapidly, a slab $\frac{3}{4}$ inch thick could be dried at about the same rate as that of a regular medium-size light salted cod. Spoilage was apt to occur before a 2-inch-thick slab was dried.

At the Vancouver Technological Station, the application of the antibiotics (1) in ice, (2) in water for dipping fish fillets, and (3) in refrigerated salt solutions for holding eviscerated fish showed that application number 3 was more effective in improving the "organoleptic quality" of the fish than in controlling the increase in numbers of bacteria. The commercial use of CTC-treated refrigerated sea water for transporting halibut and for dipping black cod before icing with ordinary ice provided a significant improvement in the quality of the landed fish. Microbiological assays indicated that raw flesh of the fish so treated either contained no detectable antibiotic or contained amounts that in most cases would not be detectable after the flesh was cooked.

Seven antibiotics tested for their efficacy in controlling growth of yeasts and molds on smoked fish and other fish products proved to be reasonably active, but none were as effective as a sorbic acid treatment previously reported.

An enzyme used in the treatment of herring stickwater prior to concentration into "solubles" also was found suitable for reducing the viscosity of whale solubles economically and without appreciable loss through bacterial spoilage. Extensive chick nutrition tests on stored herring meal containing an added antioxidant evidenced no detraction from the protein-feed quality, but the value of the antioxidant in protecting the oil in the meal from oxidation was inconclusive.

0.5 (Cross Reference: 2.01)

groups were completely absent. Quantitative determinations of the degree of coliform contamination in individual fish showed less than 50 coliforms per sq. cm. of skin, with faecal types seldom present in the 4.9-sq. cm. sample.

Bacteriology of ice.--Ice as supplied in Grimsby, Hull, and Fleetwood was found to have between $10^2$ and $10^3$ bacteria per milliliter of melt water. These counts indicated considerable contamination in the factory but not necessarily enough to be of any practical importance for fish spoilage.

Effects of handling.--In 1956, the washing of round fish in still and in running water was found to result in 80 and 90 percent reduction in surface count, respectively. Careful hand washing resulted in a 99 percent reduction in surface count. The results obtained in 1957 with 50 North Sea fish that were carefully hand washed and kept iced in the laboratory for 2 to 16 days have been analyzed statistically. A linear relationship was found to exist between the count before washing and the count after washing. The effectiveness of washing did not improve if fish with very high counts were washed. Washing reduced the count by about 98 percent.

Contamination of fillets.--The flesh in the center of a fillet near the bone side occasionally contains a large number of bacteria even when cut under very hygienic conditions from round fish that have been less than 6 days in ice. These bacteria complicate sampling methods designed to measure contamination of the fillet. The two methods of sampling eventually decided upon were (1) to measure the count in a thin surface layer of fillet and (2) to measure the total count in and on the fillet. By these methods, the counts on fillets from two or more methods of filleting, one of which was a control method, could be compared. Preliminary experiments with North Sea fish kept under controlled conditions in ice for 2 days showed counts of $5 \times 10^4$ in fillets carefully cut under laboratory conditions in the Humber Laboratory and counts of $2 \times 10^5$ in commercial fillets. These marked differences did not occur in fillets cut from fish held for 10 and 16 days in ice.

2.01 SPOILAGE OF FISH IN THE VESSELS AT SEA: 6. VARIATIONS IN THE LANDED QUALITY OF TRAWLER-CAUGHT ATLANTIC COD AND HADDOCK DURING A PERIOD OF 13 MONTHS

Castell, C. H.; Dale, Jacqueline; and Greenough, Maxine F. (Fisheries Research Board of Canada, Technological Station, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 16, 223-233 (March 1959)

Introduction. --The term "landed quality" is used to indicate the state of preservation of the fish at the time it is discharged from the vessel at the plant. Most East Coast trawlers remain at sea for periods of not more than 10 days. At the time of landing the fish will have been iced in the holds from 2 to 9 days. Obviously there will be some difference between the landed quality of first- and last-caught fish. The work described in this paper has been done to determine whether the period of the year during which the fish are caught has any effect on their landed quality.

Methods. -- Only 3- to 7-pound haddock and 3- to 8-pound market cod not stored directly against the wooden shelves and pen boards were used. For each species, a lot consisting of 10 similar fish was taken from each day's catch that had been in stowage for 3 to 9 days, inclusive. The fish to be tested were placed in special containers and taken immediately into the cutting room of the plant, where one fillet was removed from each fish. These fish were filleted, and the fillets were then quick-frozen in a contact-type freezer, packed in boxes, and delivered by truck to this laboratory, where they were held at -12° C. until tested within a period of not more than 30 days. The degree of deterioration that had taken place in these gutted cod and haddock was determined by measuring their trimethylamine (TMA) content according to the method of Dyer (1945, 1950) and Hoogland (1956). TMA values for fillets freshly cut from cod and haddock are closely correlated with the quality of the fish (Castell and Greenough 1958; Hoogland 1958).

Comparison of TMA values for cod and haddock. --Curves were obtained from plots of TMA values

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 ABSTRACTER: Martin Heerdt

2.113 CORROSION PREVENTION FOR MARINE EQUIPMENT

Devoluy, Raymond P. (The Glidden Company)
Industrial and Engineering Chemistry 51, 79A-80A (May 1959)

During the past 25 years the cost of building barges has increased 300 percent. This has caused a re-examination of maintenance policies among barge-line operators, particularly those that felt replacement was better wisdom than was good maintenance in certain types of service.

To help combat corrosin, chemical engineers have made important contributions to hull maintenance practices. The problems in this respect are as varied as are the types of cargo and the waters in which the barges travel and dock. This means that the protection should be planned at the drawing board.

Some of the important steps are (a) removal of mill scale just prior to painting the completed barge, (b) repair of paint that has been damaged by burning and welding, and (c) removal of weld slag by blasting or grinding.

The paint systems in table 1 (see over) were selected because they combine good performance with applicability under normal shipyard conditions. Many others could be included; however, it is advisable to check paint-industry sources before writing new specifications because so much progress has been made in formulation of vinyls and epoxies.

The use of antifouling marine paints on steel has been a source of much confusion. If hull examinations show antifouling paints are unnecessary, they should be omitted because they contribute to bottom pitting.

Reports indicate considerable progress has been made in the formulation of paints to make them

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 ABSTRACTER: Harold C. Johnson

2.1125 PRACTICAL METHOD OF PREVENTING A PURSE-SEINE NET FROM SINKING TO ITS FULL DEPTH

Sokolich, A. D. (U. S. Bureau of Commercial Fisheries, San Pedro, California)
Commercial Fisheries Review 21, 32-34 (May 1959)

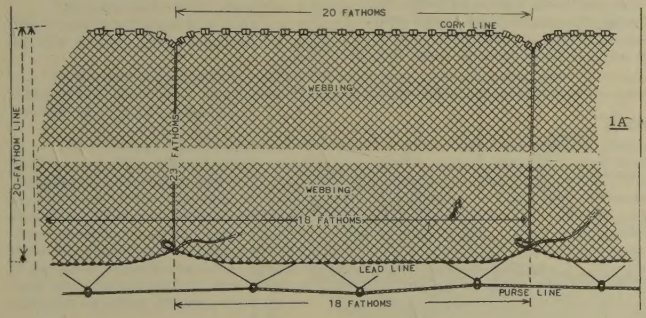


Fig. 1A-Deep purse-seine net stretched out and adjusted so that it does not sink its full depth.

In order to eliminate the risks inherent in setting a deep net in shallow water, a captain of a purse-seine vessel that fishes out of San Pedro, California, has devised a method of controlling the distance the net sinks in the water. The method consists of attaching a number of 20-fathom nylon ropes to the cork line at 20-fathom intervals. When the captain wishes to decrease the depth, the loose ends of the nylon ropes are tied to the chain lead line at points directly across the width and inside the net. These points, which are about 18 fathoms apart, are marked on the chain by painting two or

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 ABSTRACTER: Kathryn L. Osterhaug

2.9 MINAMATA DISEASE

Anonymous
Nutrition Reviews 17, 139-140 (May 1959)

Introduction. -- During the past few years the inhabitants of the Island of Kyushu have been afflicted with an apparently new disease resulting from the ingestion of fish or shellfish. D. McAlpine and S. Araki from the Department of Neuropsychiatry, Kumamoto University, Japan, found 56 people with this new type of neurological disease which was named Minamata disease for the industrial town near which all of the patients resided (Lancet II, 629 (1958)). The first symptoms appeared in the patients toward the end of 1953. The number afflicted with the disease increased through 1956, when a governmental edict was passed to prohibit fishing in the bay. Since then, no new cases have been reported. Minamata, the chief industrial town in the afflicted area, is the site of a large artificial fertilizer factory. Prior to 1950, the effluent from the factory was poured into the sea. At the latter date, a new sewer line was built which poured the water into Minamata Bay. It was not until 3 years later that the first neurological disorders were seen.

Symptoms. --The first symptom noticed was a numbness in the extremities and sometimes around the mouth, frequently followed by slurred speech, unsteady gait, and increasing disability. Deafness and disturbances of vision, the latter being confined to constriction of the visual field, were seen in most cases. Difficulty in speech, insomnia, and emotional disturbances were seen in many of the patients. Mental confusion and muscular incoordination occurred in all the patients. The more seriously ill adult patients showed an increased amount of amino acids in the urine and increased levels of gamma globulin in the blood.

Mortality. -- The most seriously ill died; the mortality rate was 33 percent. Eight patients died within 2 months after showing the first symptoms, while four died within the first year. The other

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FISH SPOILAGE

PURSE SEINING IN SHALLOW WATER

MARINE PAINT SYSTEMS

NEW DISEASE FROM FISH

2.1125

three links. The 20-fathom lines hold the net up so that between ropes it dips only about 22 to 23 fathoms.

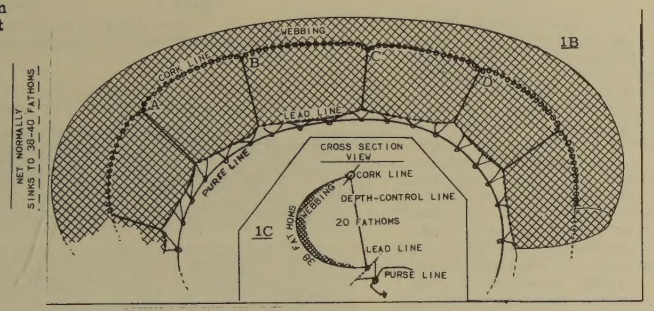


Fig. 1B-Top view of deep purse-seine net shows how the webbing balloons out behind the cork and lead lines. The only visible effect is at points A, B, C, D, etc., where the corks dip slightly where the lines are tied.

Fig. 1C-Showing how the 38 fathoms of webbing balloons out behind the cork and lead lines. The purse line prevents the webbing from sinking any deeper than about 23 fathoms between depth-control lines.

2.9

patients remained incapacitated to varying degrees. There apparently was no recovery once the individual was afflicted with Minamata disease.

Autopsy.--Four of the hospitalized patients were autopsied. They showed small necrotic areas in the intestinal mucosal membrane as the only abnormality in the viscera. The central nervous system showed cellular degeneration which was most marked in the granular layer of the cerebellum; there was dilatation of the perivascular spaces, with occasional softening, but no demyelination. There was edema; and occasionally, small hemorrhages. The spinal cord showed small hemorrhages.

Frequency.--All 56 patients who had Minamata disease frequently ate fish from the bay. In many instances, two or more members of the same family had the disease. In the neighboring families where this disease did not appear, fish from the local bay was consumed either not at all or in very small amounts. The affected individuals ranged in age from a few years through adulthood, with all ages and both sexes being equally represented. Infants were protected, probably because they were breast-fed until the age of two.

Factor unknown.--The factor causing the neurological disturbances is unknown. It appears to be heat stable, since some of the individuals who developed the disease ate nothing but cooked fish. Cats, crows, and possibly such animals as pigs and dogs, appeared to be susceptible to a similar disease. The brains of ten cats that had died of this condition showed changes similar to those seen in the human material. It was reported that the disease could be readily produced by feeding cats fish from the bay for 2 to 4 weeks.

Although the fish from the bay and the effluent from the factory showed increased amounts of manganese, selenium and copper, the manifestations of the disease are not those normally associated with the toxicity of these elements (Nutrition Reviews 3, 50 (1945)).

2.01

obtained (1) from 3,860 large haddock and 3,120 market cod that had been held 3 to 9 days in the vessels and (2) from a mixed group of 9,550 cod and haddock. TMA values ranged from 0.5 to 2.5 at the end of 9 days, with little apparent difference between lots. The mean values for the cod were slightly higher than those for the haddock, but the differences were extremely small.

Seasonal changes in the TMA values.--Curves obtained from plots of the monthly mean TMA values and their standard errors for the 4- to 9-day-old mixed cod and haddock landed by all the trawlers during the test period November 1956 to November 1957, inclusive, clearly show a seasonal variation in the TMA values. The characteristics of these curves became more pronounced as the storage period increased from 4 to 9 days. Low TMA values were obtained during February, March, April, and May and during September and October. High values were obtained during the other 6 months of the test period. The mean TMA values for the 4- to 8-day mixed cod and haddock during the whole test period were 0.65 and 1.90, respectively. November and December 1956 and June, July, and August 1957 yielded the highest proportion of fish with TMA values above the mean, for the test period.

Seasonal TMA values for fish from individual trawlers.--Data from four individual trawlers showed the same seasonal trend as was found for the whole fleet. This similarity was greatest with those vessels that were known to take the best care of their fish and in particular with those vessels in which the fish were stored in ice for 7 and 8 days.

Seasonal variations in the grades of fish.--Because the TMA values for gutted cod and haddock were correlated closely with organoleptic quality. TMA values under 1.0 corresponded to Grade I fish, and values of 1.1 to 7.0 corresponded to Grade II fish (Castell et al. 1958; Hoogland 1958). Out of the 9,550 fish sampled, less than 20 had TMA values over 7.0. Of the 8-day fish landed in February, March, April, May, and September, 40 to 50 percent were Grade I quality. Almost no Grade I fish of this age were landed in November and December, and very few were landed during January, June, and July.

2.113

safer and easier to apply. High-build vinyls are an example. The fast drying time of vinyls is important for shipyard paintings, but they suffer from lack of moisture tolerance, which is characteristic of most paints. The polyamide-catalyzed epoxies adhere to wet surfaces, cure in moist atmospheres, possess a high flash point, and are easy to apply. The development of moisture-tolerant epoxies has coincided with the U. S. Navy's development of an inexpensive soaking technique using dilute sulfuric acid in sea water for removing rust scale.

Table 1.--Four types of paint systems used on barges

| | Total film thickness, mils |
|---|---|
| System 1, Conventional paints<br>2 coats red lead primer (BuShips formula 116)<br>2 coats oleoresinous or alkyd top coat | 5 |
| System 2, Vinyl alkyds<br>1 coat metal conditioning primer (wash primer)<br>2 coats vinyl-alkyd red lead<br>1 coat vinyl-alkyd color coat | 5 |
| System 3, Vinyls<br>1 coat metal conditioning primer<br>1 coat vinyl red lead anticorrosive<br>1 heavy coat vinyl metallic mastic<br>1 coat vinyl or vinyl-alkyd color coat, depending on chemical environment | 7 |
| System 4, Epoxy-polyamide<br>1 coat Nu-Pon primer<br>3 coats Nu-Pon enamel alternating colors | 7-8 |

2.118 THE FREEZING OF FISH AT SEA FOR INDUSTRIAL PURPOSES

Banks, A. and Eddie, G. C. (Torry Research Station, Aberdeen, Scotland)
Modern Refrigeration 61 (November 1958) (Reprinted)

In this paper the authors discuss the quick freezing of fish in slabs ranging in weight from 30 to 100 pounds. These large packs are not intended to be sold to the consumer but to be thawed and, in many cases, further processed. This type of operation has been studied at Torry Research Station for two applications: the freezing of white fish at sea in large trawlers of orthodox type and the cheap freezing of drift-net herring in bulk on shore.

Freezing methods.--Because it was not thought practicable to fillet fish on a ship of 185 feet, on the Northern Wave, gutted cod were frozen whole in slabs weighing 63 pounds. Most of the cod were frozen headless. The blocks of fish produced were 4½ inches in thickness. The thickness probably could be reduced to 4 inches with a corresponding reduction in freezing time. If two operators were available at all times for loading and unloading freezers and stacking, the weight of the blocks could be increased to 84 pounds or more.

The freezers were of the vertical-plate type similar in principle to freezers used in Norway and New Zealand for whale meat. Loading was very simple, the fish making good contact with the plates by reason of their own weight. No wrappers were used, and because there was direct contact between the fish and the freezer plates, there had to be a very quick-acting, hot-gas defrost system for the release of the frozen blocks. The plates were of a well-known embossed steel design, the refrigerant being "F-12" at -40° F., supplied by pump but only in sufficient quantity to achieve dry expansion. Further development tests have indicated that an increase in heat transfer from refrigerant to plate can produce a worthwhile improvement in freezing time. It is also believed that the performance of most contact freezers could be improved by better designed plates. Work on both these lines

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 ABSTRACTER: Kathryn L. Osterhaug

2.12 SUMMARY REPORT OF EXPLORATORY LONGLINE FISHING FOR TUNA IN THE GULF OF MEXICO AND CARIBBEAN SEA 1954-1957

Wathne, F. (Bureau of Commercial Fisheries, Seattle 2, Washington)
Commercial Fisheries Review 21, 1-26 (April 1959)

Commercial-scale longline fishing for tuna in the Gulf of Mexico on three cruises in 1955 and 1956 produced tuna at a rate considered to be of commercial magnitude for an American operation in this area. The seasonal and geographic distribution of yellowfin tuna in this area is discussed.

In the northern areas, yellowfin tuna are present from June through December but are absence during the balance of the year. Yellowfin are apparently present in the southern Gulf (Gulf of Compeche) during all seasons.

The vertical distribution of the longline gear, as measured by depth sounder, and the factors influencing this distribution--such as currents, wind, slack allowed when setting, soaking time, and sagging of the end baskets of the set--are discussed and illustrated. The catch rate of yellowfin tuna in relation to the position of the hooks on the basket is tabulated. The relationship is similar to that found in the tuna longline fisheries of the Pacific; that is, the rate of catch of the end hooks of individual baskets is lower than the rate of the center hooks. This disproportionate distribution of the catch by hook position was apparently corrected by constructing experimental gear with the end branch lines 2 fathoms longer than the middle ones. The object of this was to reduce interference between the bait and the mainline, since the end hooks are fishing much closer to the mainline because of it's normal sagging shape.

Comparison of the relative effectiveness of various bait species revealed no superior types;

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 ABSTRACTER: Fredrick Wathne

2.144 THE EFFECT OF ARTIFICIAL LIGHTS ON FISH AND OTHER MARINE ORGANISMS AT SEA

Blaxter, J. H. S. and Parrish, B. B. (Scottish Home Department)
Marine Research (Scotland) 1958, No. 2, 24 pp. (1958)

The objectives of work with lights that has been directed from the laboratory at Aberdeen, Scotland, since 1952 have been (a) to study the behavior of fish in response to lights; (b) to investigate the possibilities of using lights to attract or repel fish, particularly herring, as an aid to commercial fishing; and (c) to assist in interpreting echo tracers.

Lights used.-- Lights of different intensities and colors were used: intensities varied from 15 to more than 1000 watts, and colors included red, blue, green, and yellow. In addition, clear and opaque tungsten-filament lamps were used.

Light bulbs between 15 and 100 watts were housed in watertight cases that consisted of a brass base fitted with a watertight gland for the cable. The bulb was surrounded by a well glass with a ground-glass rim fitted into a groove in the base, the join being made watertight with high-vacuum grease.

Bulbs of 1000 watts and over were housed in a larger case that consisted of a vertical glass cylinder with cast fittings at either end.

Sampling of aggregations.--The methods used in these experiments for identifying and sampling organisms aggregated by the lights included (1) observations at the surface, (2) underwater photography, (3) underwater television, (4) drift nets, (5) "blanket" or "lift" nets, (6) boom net, and (7) explosives.

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 ABSTRACTER: Kathryn L. Osterhaug

2.149 AIR CURTAIN CONCENTRATES MAINE HERRING

Anonymous
National Fisherman 40, 13, 32 (May 1959)

Following successful experiments by researchers of the U. S. Bureau of Commercial Fisheries during the past two seasons, several Maine herring fishermen are planning to use the air-bubble system of fishing this year. A seiner out of Portland, Maine, is being equipped with a 196 cubic inch capacity compressor that will produce 138 cubic feet of air per minute. It will be V-belted to a gasoline engine and connected to 500 feet of ¾-inch hose and 500 feet of 1-inch hose.

A curtain of air bubbles was first tried by researchers of the Bureau of Commercial Fisheries as a means of influencing the movements of Atlantic herring schools in Maine coastal waters during the fall of 1957. The initial trials, using an air curtain 500 feet in length, established that herring schools would avoid passing through such a curtain and that consequently their movements could be influenced with it. Additional trials, made late in 1957, were successful in driving herring schools from the center of a cove up into shallow water near the shore.

An extended air curtain 1200 feet in length was tried out during the fall of 1958.

Rapid tidal flow, depth of water, boat traffic, and flow of debris, factors which often prohibit the use of seine gear, do not prohibit the use of an air curtain.

The equipment used for the 1958 work consisted principally of a 12-foot length of polyethylene plastic flexible pipe, with holes drilled at 1-foot intervals and two air compressors supplying air, one at each end of the pipe. The pipe was weighted with lead to make it sink and was laid out and

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FREEZING FISH IN BULK

LONGLINING FOR TUNA

ARTIFICIAL LIGHTS IN COMMERCIAL FISHING

FISHING WITH AIR CURTAIN

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however, squid was found to be definitely inferior. The factors affecting bait effectiveness, including visibility and ability to remain on the hook during the fishing period, are discussed.

No relationship between yellowfin catches and surface water temperatures was evident. It was noted, however, that when the temperature of the subsurface water within the fishing zone of the gear (18 to 50 fathoms) was above 72° F., the catches were consistently poor.

Shark damage to the yellowfin catch ranged from 4.2 percent to 23.2 percent per cruise and averaged 13.6 percent for all cruises.

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retrieved with a power-driven hose reel.

Holes of two sizes were drilled in the plastic pipe. A 200-foot section nearest the smaller compressor was bored at 1-foot intervals with a .0222-inch diameter drill. The remaining 1000-foot length was bored with a .0312-inch diameter drill. Two sizes of plastic pipe were used, 1-inch and $\frac{3}{4}$-inch. A 500-foot length of 1-inch pipe was connected to the larger compressor, 200 feet of 1-inch pipe to the smaller compressor, and a 500-foot length of $\frac{3}{4}$-inch pipe was connected between the two sections of 1-inch pipe. All sections of pipe were weighted with a wrapping of 3/16-inch lead wire to make them barely buoyant in sea water. The lead wrappings were covered with plastic insulation tape. Additional $2\frac{1}{2}$-pound leads were attached by 18-inch beckets at 20-foot intervals to the pipe as it was payed out so that the pipe floated 18 inches from the bottom. This method of weighting was used to avoid catching on small obstructions when sweeping the pipe across the bottom. Spongex seine floats were attached to the pipe with 10-fathom lines at 100-foot intervals. The lines were used to lift the pipe over larger obstructions and to tow the pipe across the bottom.

Improvements possible.--After each period of operation of the air curtain during the fall seasons of 1957 and 1958, certain improvements in the gear have been made. The latest work also showed up certain improvements and additions to the gear that would increase its efficiency. The most obvious improvement that could be made is to extend the length of the curtain. A 2400- or 3000-foot air curtain would be of much greater value in a larger number of fishing areas than one of 1200 feet. This extension could be made using the same air compressing capacity, by reducing the size of the holes in the plastic pipes from 1/32 inch in diameter to 1/64 inch in diameter. These smaller holes having only $\frac{1}{4}$ of the cross-sectional area would spread a thinner air curtain over a much greater distance. Results to date indicate that a lighter air curtain of this type would probably lead herring schools and could be used to drive them if the fish were not crowded too fast.

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is in progress at the Torry Research Station. It seems likely that the throughput per unit of space occupied by the Torry-Hall vertical-plate freezers can be considerably improved, although the Northern Wave installation was itself notably compact, bearing in mind the thickness of the slabs produced and the fact that they were discharged from the freezer at a mean temperature approaching -30° C.

The vertical-plate freezer, with a hot-gas defrost arrangement permitting direct contact between fish and plate, is very suitable for freezing industrial packs with the minimum of labor, since loading is very simple. For a cheap method of freezing herring that would retain high quality, the vertical-plate freezer seems to have possibilities, since it is reasonable to expect that the herring can be poured or piped into the space between the plates.

Examination of the quality of herring produced in vertical-plate freezers has now been under way for 2 years. The freezer used produces rectangular blocks that are 33 pounds in weight when 2 inches thick. Such blocks, after glazing and storage, show less development of oxidative rancidity than do well-glazed herring frozen in air blast in single layers, presumably because of the reduced surface area for a given weight. However, present experience shows that somewhat greater damage may occur in the vertical-plate frozen herring. This may occur in the freezer or, perhaps more likely, during thawing. Thawing of blocks of fatty herring with thicknesses greater than 2 inches is especially difficult, owing to the ease with which mechanical damage may occur when layers of herring already thawed are being removed. This problem may be solved by improved methods of thawing, or it may be necessary to investigate the production of industrial packs by air-blast methods in substantially single layers, the vertical-plate freezer being unsuitable for blocks less than about 2 inches thick

No attempt has yet been made to produce large slabs of frozen fillets or steaks in a vertical-plate freezer.

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Results.--The brightest lights were most effective in producing aggregations. The use of light intensities varying from 10 to 100 candle power demonstrated that whiting aggregate at a relatively low optimum density (about 0.1 lux) away from the lights, whereas herring and sprats seek much higher intensities (100 to 10,000 lux) and concentrate around the most powerful lights used.

No conclusions were reached about the use of different colors.

In assessment of the value of lights in commercial fishing, the following conclusions were reached: Lights might be of advantage in fishing for whiting by hand and longline in the Scottish inshore fisheries, or encircling nets might be adapted to catch aggregated fish. Lights would not be likely to benefit trawl or seine fisheries unless experiments showed that lights attached to these gears would prevent fish from escaping round the nets. Although few experiments were carried out on adult herring, no evidence that they will aggregate in response to artificial lights is available. Lights might be of use in the sprat and juvenile herring fisheries, particularly in areas where the water is clear. It is probable that the most effective means of catching aggregations of such fish would be by pumping devices, but the ring-net or purse-seine fishing techniques might again be adapted to this end.

3.12 ANTIBIOTIC NOW OK FOR FISH

Anonymous
Food Engineering 31, 41 (May 1959)

Approval. -- Concluding that the experience with poultry had proved this antibiotic harmless when used in limited amounts, FDA on April 14 OK'd a petition by American Cyanamid Co. for use of chlortetracycline at 5 parts per million (p.p.m.) on fresh fish, shucked scallops, and unpeeled shrimp. Clearance was under Miller Pesticide Bill.

Processed seafoods such as fish cuts, steaks, fillets, peeled shrimp, and shucked oysters were not included. The company is expected to file a separate petition for use on processed fish.

Background. --For more than 3 years, antibiotics have been used as a dip for fish fillets in Canada. This treatment has more than doubled their shelf life--enabling shipment of cod fillets, for example, from the east to the west coast by rail under regular ice refrigeration.

During the same period, it is estimated, more than ½ billion pounds of fresh poultry have been treated with the antibiotic in the U.S.

In addition, extensive experiments have been conducted on fish with ices, dips, and sprays containing the chlortetracycline. Antibiotic ice was found to fit most generally with present-day operations aboard ship.

Antibiotic ice. -- Although FDA's approval is for use as a dip or as an ice by commercial fishermen on fresh caught, whole, headed, and gutted fish, major anticipated use of the antibiotic is in an ice.

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3.2381 TECHNICAL NOTE NO. 51 - USE OF CORN-SIRUP SOLIDS IN PACKAGING AND FREEZING FISH

Dassow, John A. (Fishery Technological Laboratory, U. S. Bureau of Commercial Fisheries, Seattle 2, Washington)
Commercial Fisheries Review 21, 20-24 (March 1959)

Observations and limited studies on three uses of corn-sirup solids indicate (1) that a solution of corn-sirup solids may be used as a protective dip or coating in packaging and freezing fish, (2) that the use of smaller concentrations of either corn-sirup solids or dextrose in ice-glazing solutions produces a glaze of desirable properties for frozen whole or dressed fish, and (3) that either corn-sirup solids or dextrose may be used in salt brines to produce immersion-freezing media of desirable properties.

Characteristics of corn-sirup solids. --They are widely accepted as a food component; are readily soluble in water; are colorless, almost tasteless, and odorless; are stable in storage at room temperature; and are economical. In these tests a regular-conversion corn-sirup hydrolyzate of 42 dextrose equivalent (42 D.E.) was used. Pure dextrose is 100 D.E.

Use of corn-sirup solids as a protective coating. --Several tests in which salmon steaks and fillets were dipped in dense solutions of corn-sirup solids before being wrapped and frozen indicated that the coating was effective in minimizing oxidation of surface meat during storage at 0° F. In the series in which fresh salmon were used, the coating was noticeably effective in minimizing the fading and discoloration of the astacin pigments in the surface meat and in retarding the development of rancidity. In tests with fish that had been stored in the frozen state prior to treatment with corn-sirup solids, the coating was not always effective.

The corn-sirup solids were applied in solutions of 30, 45, and 65 percent by weight. From a

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 ABSTRACTER: Richard W. Nelson

3.12 EXPERIMENTS IN THE USE OF ANTIBIOTICS IN FISH PRESERVATION

Shewan, J. M. and Stewart, J. (Torry Research Station, Aberdeen, Scotland)
D.S.I.R. Food Investigation Memoir No. 1203, 15 pp. (1958)

British experiments with the use of antibiotics for the preservation of fish have been confined largely to the use of ice that contains chlortetracycline (CTC) for extending the storage life of white fish such as cod, haddock, plaice, and sole. Some experiments also were done with fillets of white fish that had been dipped in a CTC solution and stored at temperatures from 0° to 15° C. In all, over 20 antibiotics and antibacterial substances have been tested either singly or in combination. The results obtained so far indicate that the broad-spectrum antibiotics such as OTC and CTC are the most effective. Most of the work reported here was done with CTC.

The preservative action of the antibiotics was measured primarily by organoleptic methods, using a trained laboratory taste panel. In addition to sensory examinations, chemical tests, including the estimation of total volatile base (TVB) and trimethylamine (TMA), were performed. Bacterial counts also were obtained, and in some cases, a qualitative analysis of the flora during storage was obtained.

Experiments with whole iced fish. --The more important results from the laboratory, pilot-scale, and commercial trials may be summarized as follows:

1. Laboratory-scale tests with codling and haddock indicated that the useful storage life of these fish could be increased about 10 days by storing in ice that contains 5 p.p.m. CTC immediately after catching.

2. These results were confirmed in pilot-scale trials involving the use of several tons of fish,

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 ABSTRACTER: Kathryn L. Osterhaug

4.11 SIGNIFICANCE OF ULTRAVIOLET ABSORPTION DATA OF FISH-OIL FATTY ACIDS

Gruger, Edward H., Jr.
Commercial Fisheries Review 20, 12-14 (November 1958-Supplement)

Fish oils are made up largely of triglycerides that contain straight-chain fatty acid groups having both saturated and unsaturated carbon-carbon chain linkages. The unsaturated fatty acids obtained from fish oils may possess from one to six carbon-carbon double bonds per molecule. Experimental results indicate that these double bonds are separated by single methylene ($-CH_2-$) groups. That is, the unsaturated portions of the fatty acids have nonconjugated structures.

The absorption of ultraviolet light at certain wave lengths is characteristic of definite chemical structures. The ultraviolet absorption caused by carbon-carbon unsaturation is brought about only by a conjugated double-bond system. The fatty acids in fish oils occur naturally with nonconjugated unsaturation. For the ultraviolet absorption method of analysis to be effective with fish-oil fatty acids, the unsaturation in these acids therefore must be converted to the conjugated form. For example, the following equation depicts the isomerization process of nonconjugated 9, 12-octadecadienoic acid to the acid possessing conjugated unsaturation:

$$CH_3(CH_2)_4CH{=}CH{-}CH_2{-}CH{=}CH(CH_2)_7COOH \xrightarrow[\text{heat}]{\text{alkali}} CH_3(CH_2)_4{-}CH_2{-}CH{=}CH{-}CH{=}CH(CH_2)_7COOH$$

Analytical method. --The double bonds in unsaturated fatty acids are conjugated by alkali-isomerization. The analytical procedure commonly employed is that of the American Oil Chemists' Society Tentative Method Cd 7-48: An 80-milligram sample of fatty material is mixed with 11 grams of

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 ABSTRACTER: Edward H. Gruger, Jr.

CHLORTETRACYCLINE FOR FISH

ANTIBIOTICS FOR FISH

CORN-SIRUP SOLIDS FOR FROZEN FISH

ULTRAVIOLET ABSORPTION OF FATTY ACIDS

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including haddock, codling, whiting, sole, and plaice.

3. Tests on a commercial trawler reconfirmed the laboratory and pilot-scale findings.

Several interesting features emerged from this experimental work. It was observed, for example, that a difference in quality between the fish in ordinary ice and those in antibiotic ice became noticeable only after the 10th to 12th day of storage. The most striking feature organoleptically in the raw fish was the suppression of thick yellow slime, a noticeable feature of most species of white fish after storage in ice for more than 16 days. Differences also were discerned in the cut fillets. Fillets from the antibiotic-treated fish always looked more translucent and less bleached, whitish, and opaque than did the control fillets.

Tests carried out with fish from both the laboratory and pilot-scale trials showed that antibiotic-treated fish could be used for all purposes for which normal iced fish are used.

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Manufacture of this special ice is quite simple. Block, flake, or chip ices containing chlortetracycline are prepared by freezing solutions of Acronize. For block ice, a dry formulation containing not less than 16½ percent antibiotic in combination with a protective colloid and a salt is added to the water.

The colloid causes formation of a gelatinous network throughout the solution. Herein, the antibiotic is fixed by the binding action of the salt. Resulting ice, containing about 5 p.p.m. chlortetracycline, has a very pale, uniform greenish-yellow color.

Application of the antibiotic ice is recommended for chilling fish under customary conditions. For added protection, it has been found effective for re-icing fish when necessary, and may permit transportation over greater distance.

Conclusions.--As in the case of poultry, antibiotic treatment of fish is no substitute for sanitation. It cannot make bad fish good. But the article states that it can make good fish remain good longer by retarding bacterial growth.

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21-percent potassium hydroxide in ethylene glycol that is preheated to 180° C. (356° F.) in a suitable isomerization flask. An atmosphere of nitrogen is passed over the mixture during the entire isomerization process. The mixture is held at 180° C. for exactly 15 minutes, after which time the reaction is stopped by immediately cooling it to room temperature. The cooled mixture is diluted with an appropriate solvent to a known volume such that the concentration of isomerized material permits adequate measurement of the ultraviolet absorption spectra.

Spectral absorption peaks at 233, 268, 315, 346, and 374 millimicrons are the result of the presence within the molecules of two, three, four, five, and six conjugated carbon-carbon double bonds, respectively. From the relative heights of the absorption peaks can be calculated specific extinction coefficients. The extinction coefficients are used to determine the quantity of material present in the analyzed mixture which contribute to the particular absorptions. (This is discussed in the next section.)

The specific extinction coefficients are calculated from the equation $k = \frac{A}{c \cdot l}$

where k is the specific extinction coefficient, A is the absorbance (or optical density) at a given wave length, c is the concentration of isomerized substances in grams per liter, and l is the cell length in centimeters.

Considerations.--An increase in molecular weight causes a lowering of the molar concentration of double bonds for a given weight of sample. This then lowers the spectral absorption due to the double bonds and consequently lowers the specific extinction coefficient. These changes can be seen by examining the equation above.

With mixtures of highly unsaturated compounds from fish oils, such as fatty acids and fatty alcohols, the specific extinction coefficient calculated for a given wave length is an additive value resulting from each compound in the mixture.

One further matter to consider is the possibility of the existence of fatty acids of $C_{20}$ to $C_{24}$ chain lengths having only two or three carbon-carbon double bonds. Until the contrary has been unquestionably proven and reported, complete fatty acid analysis by ultraviolet absorption will not be possible.

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commercial viewpoint, the 30-percent coating would be the most desirable because the lower pick-up makes it more economical.

Use of corn-sirup solids in glazing frozen fish.--A 2- to 3-percent solution of corn-sirup solids was found to produce an excellent glaze with the resilient properties desired for glazing dressed fish directly from the freezer. The glaze is transparent and resists cracking caused by changes in temperature.

Use of corn-sirup solids or dextrose in immersion freezing.--Corn-sirup solids or dextrose may be used in high concentration in salt brine to produce an immersion-freezing solution of desirable characteristics. The salt and corn-sirup solids lower the freezing point of the solution, and the corn-sirup solids or glucose minimizes the absorption of salt into the product being frozen.

Work at the Boston Fishery Technological Laboratory demonstrated that a solution of 34 percent glucose and 12 percent salt (by weight) could be used satisfactorily to freeze lobsters at 0° F. In other tests, a solution of 20 percent glucose and 20 percent salt was used for immersion-freezing of scallop meats with good results.

Recommendations applying to freezing in modified brines are similar to those applying to freezing in straight salt brine.

Some products may not be immersion-frozen with good results even in the modified brine. Pacific oysters frozen in various solutions of corn-sirup solids and salt absorbed salt too readily and had a short storage life. These results suggest that experimental trials with each type of product should be made to determine the effect of the immersion-freezing and of the subsequent cold storage on the quality of the product.

4.61 ASCORBIC ACID AS AN ANTIOXIDANT FOR FROZEN OYSTERS AND EFFECT OF COPPER-CHELATING ABILITY OF OYSTER TISSUE ON ASCORBIC ACID OXIDATION

Schwartz, Mark G. and Watts, Betty M. (Department of Food and Nutrition, The Florida State University, Tallahassee)
Commercial Fisheries Review 21, 1-6 (March 1959)

Introduction.--Fishery products are susceptible to oxidative rancidity, owing to their content of highly unsaturated oil, and ways and means of protecting them are being sought. Among the antioxidants tested by various workers, ascorbic acid is one that has been used on a number of products. Some workers found ascorbic acid effective in retarding rancidity, whereas others found it not effective.

Considerable evidence is available to implicate copper in cases where ascorbic acid acts as a prooxidant. Kelly and Watts (1957) suggest that the free radical formed in the copper-catalyzed oxidation of ascorbic acid can cause the dehydrogenation of the active methylene group of the fat, which is believed to initiate fat rancidity.

Purpose.--Since the copper content of oysters varies between 0.1 and 0.2 milligrams per gram, one would expect ascorbic acid to accelerate rancidity in the oyster unless the copper is bound within the oyster tissue. The objectives of the present investigation therefore were (1) to study the antioxidant effect of ascorbic acid on oysters and (2) to measure the copper-chelating ability of oyster tissue.

Antioxidant procedure.--Fresh-shucked oysters (Crassostrea virginica) were divided into groups, and individual groups were treated as follows: (1) frozen in bulk after being treated with a 10-percent

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 ABSTRACTER: Richard W. Nelson

6.132 A REPORT ON DEHYDRATED GROUND FISH

Snyder, William A.
American Fur Breeder pp. 14, 44 (April 1959) (Reprinted)

Two well-known animal nutritionists have developed a dehydrated ground fish that may have overcome most of the objections that animal breeders have against fish products as a protein supplement. Dr. Howard E. Worne and Dr. Thomas L. Meade developed and tested the new dehydrated, ground fish product.

The production process features the rapid cooking of fish at 185° and immediate dehydration using a method that eliminates oxidation.

Dr. Worne and Dr. Meade report the following advantages for the new stabilized protein supplement, which is a menhaden product:

1. It assures freedom from rancidity.

2. It offers the highest energy values of commercially available protein supplements because of stabilized fat content.

3. It brings with it great economics, offering the highest biological values (in the fish portion of the diet) at the lowest cost.

4. It is dehydrated, requiring less storage space and no shipment of "water." Upwards to 80 percent of whole fish is water. Six pounds of the new dehydrated, ground fish will replace 30 pounds of whole fish.

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 ABSTRACTER: Kathryn L. Osterhaug

4.91 INFLUENCE OF DIETARY COD-LIVER OIL AND SOME FRACTIONS OF COD-LIVER OIL ON SERUM CHOLESTEROL-LEVEL OF RATS

De Groot, A. P. (Central Institute for Nutrition and Food Research, T. N. O., Utrecht, The Netherlands) and Reed, S. A. (Marfleet Refining Co., Ltd., Hull, England)
Nature 183, 1191 (April 25, 1959)

Introduction.--From numerous experiments with humans and experimental animals it is known that the cholesterol content of the blood is greatly influenced by the amount and kind of dietary fat. In general, the relatively unsaturated vegetable fats decrease the serum cholesterol-level, while an increasing influence is observed with the relatively saturated animal fats. The highly unsaturated oils from marine animals, however, exert a potent cholesterol-lowering activity. This effect was observed in humans following the consumption of seal oil, sardine oil, whale oil, and pilchard oil, and also in rats fed sardine oil.

So far it is not yet decided what compounds of the fats are responsible for the action on cholesterol. The polyenoic acids, linoleic acid and arachidonic acid, applied in pure form, were found to be very active in lowering serum cholesterol-levels, whereas hydrogenation of highly unsaturated fats was accompanied by a decrease in activity. These findings suggest that the fatty acid fraction is responsible for the effect observed. However, other experiments suggest that the unsaponifiable fraction of vegetable oils possesses cholesterol-lowering properties.

Experimental.--We have studied the cholesterolemic properties of cod-liver oil and some fractions thereof by feeding them to groups of 10 to 12 newly weaned rats in a hypercholesterolemic basal diet of the following percentage composition: casein 15, potato starch 10, wheat starch 57.5,

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3.4 SMOKE CURING: KIPPERING - PROCESSING AND QUALITY CONTROL

Anonymous
Food Investigation 1957, Report of the Food Investigation Board (Great Britain), pp. 17-18 (1958) (London)

Introduction.--The trial run of the voluntary quality-assessment scheme for kippers produced in Hull came to an end in 1956. The scheme, which has proved very successful, is being taken over by the Herring Industry Board on a national scale. The training of a panel is being carried out at the Humber Laboratory, and the confidential results will continue to be sent to each curer. When the new staff is adequately trained, the Board plans to extend the coverage to other ports. Eventually the new staff will function independently to advise the industry on how best to maintain good quality. The White Fish Authority Advisory Panel on White Fish Smoking has asked the Department of Scientific and Industrial Research to establish a similar scheme for smoked white fish.

The development of a more accurate panel scheme for the qualitative assessment of kippers is being continued at the Humber Laboratory.

Experimental.--A few experiments have been conducted in which a fluidizer smoke generator has been used as a research tool to study the effect of smoke from different woods upon the color and flavor of smoked fish. These have served to emphasize the complexity of the problems involved and to show that smoke density as measured optically does not necessarily correlate with color, smoke flavor, or chemical measurements of smoke deposition for different types of smoke.

Results.--Adequate smoking is required; otherwise the fish will not withstand the conditions of temperature that prevail during distribution. These findings have been confirmed by a number of experiments in which fish cured with different amounts of smoke and stored at 68° F. have been

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 ABSTRACTER: Martin Heerdt

ASCORBIC ACID FOR OYSTERS

COD-LIVER OIL VS. CHOLESTEROL

STABILIZED FISH MEAL

STUDIES IN KIPPERING

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minerals 4, vitamin mixture 2.1, choline chloride 0.2, hydrogenated coconut oil 10, cholesterol 1.0, and cholic acid 0.2. Different fats or fractions of cod-liver oil were added at the expense of equal amounts of wheat starch. Fractions of cod-liver oil were prepared after saponification with potassium hydroxide in the presence of ethanol. After feeding the experimental diets ad lib. over 4 weeks, the amount of total serum cholesterol of each rat was determined by the Liebermann-Burchard reaction.

Results.--The results show that the growth-rate was very poor, that is, only half that obtained on a stock ration. This may be ascribed to the sub-optimal protein content and the high fat content of the diet and to the presence of cholesterol and cholic acid. With corn oil in the diet, growth-rate was highest and somewhat higher than with cod-liver oil. The esterified fatty-acid fractions caused a decrease in food intake which was paralleled by a slower growth-rate.

The serum cholesterol-level obtained with corn oil was much lower than with hydrogenated coconut oil. With cod-liver oil a significantly lower value was obtained than with corn oil ($P = 0.003$ according to Wilcoxon's test). The ethyl esters of cod-liver oil fatty acids decreased the cholesterol content to nearly the same degree as did whole cod-liver oil. The mean serum cholesterol values obtained with the cod-liver oil fractions with different melting points were not significantly different. This may be the result of incomplete separation or of equal cholesterol-lowering properties of the various fatty acids present in the different fractions. The unsaponifiable fraction, in an amount equivalent to the level present in the whole cod-liver oil, exerted no distinct hypocholesterolemic action. The combination of unsaponified fraction with the esterified fatty acid fraction resulted in a mean value not significantly different from that obtained with whole cod-liver oil ($P > 0.05$).

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subjected to examination for appearance, odor, flavor, and bacteria. Fresh herring subjected to smoke at a density of about 0.3 optical units per foot in a mechanical kiln until they had lost 5, 10, or 15 percent water by weight kept for 2, 5, and 7 days, respectively. Similar, commercially smoked fish did not keep as well on the basis of taste-panel scores or the appearance of mold. Bacteriological results indicated that micrococci assume an important role in the spoilage of moderately cured and well-cured kippers.

Studies also were made to evaluate the effects of wrapping on the quality of smoked fish. The actual material used for wrapping pairs of kippers has very little effect upon shelf life at room temperature. Molds, however, grow more rapidly on wrapped than on unwrapped kippers, owing to the high humidities to which wrapped fish are exposed.

Experiments conducted with kippers that are vacuum-packed in cellulose laminated to polyethylene indicated that this method of wrapping may have commercial applications for a certain limited market. Kippers packed in this film and stored for 3 months at -10° F. were free from any detectable rancidity.

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solution of ascorbic acid so that final concentration of ascorbic acid was 1 percent; (2) frozen individually and then dipped in either 0.5-percent ascorbic acid or 1-percent ascorbic acid; and (3) cooked in a 0.1-percent ascorbic acid solution and then frozen. A 100-gram sample of oysters was removed from the freezer every 2 months over a period of 6 months, and the TBA test was employed to follow oxidative changes. Odor and flavor were evaluated by a small group of two to four persons actively engaged in oyster research.

Antioxidant results.--Raw, untreated oysters frozen in bulk showed no consistent increase in rancidity as measured by TBA value. The application of ascorbic acid, therefore, was not measurably beneficial. Ascorbic acid, however, did give protection against rancidity to raw oysters frozen individually and to cooked frozen oysters.

Copper-chelating procedure.--Copper-chelating ability was determined by measuring the degree of inhibition of the copper-catalyzed oxidation of ascorbic acid in a Warburg apparatus in the presence and in the absence of raw and of freshly cooked oyster tissue.

Copper-chelating results.--Cooked oysters were found to have greater copper-chelating ability than had raw oysters. The fact that the cooked oysters also apparently have greater exposure of the sulfhydryl group is offered as a suggested explanation of the greater copper-chelating ability of the cooked oysters.

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5. It will require no refrigeration, since it is perfectly stabilized and free from the possibility of rancidity, a factor which will mean added economy.

6. It is uniform in its nutritional values, featuring guaranteed amino acid values.

7. Its no-rancidity factor will allow breeders to keep large quantities on hand, eliminating fear of short market supplies.

6.1 NEW SYSTEMS TO INCREASE THE EFFICIENCY OF OF FISH MEAL PLANTS

Anonymous
Industria Conservera 24, No. 224, p. 41 (Feb. 1958) (In Spanish)
World Fisheries Abstracts 10, 41-42 (January-February 1959)

This is a resume of the conclusions reached by a representative of a European firm manufacturing fish meal equipment. In the Union of S. Africa, the fish are usually transported from the boat to the plant by pumps, in spite of the loss of proteins. Although generally the mixture of salt water and blood is discarded, the Scandinavian factories utilize it, especially when using indirect cookers. An analysis of this liquid shows a content of 20 percent salt and 5 percent proteins which may be recovered by cooking or by using coagulants. In the latter case, the mixture of water and blood, after being coagulated, is passed through a vibrating screen to recover the proteins. Indirect cookers are rapidly replacing the direct cookers because it is possible to achieve a saving in steam when recovering the stickwater. Besides, the raw material is treated under better conditions and with more efficiency. In a 20-ton/hr. fish meal plant, direct cooking adds about 6,000 lb. (2,721 kg.) of condensation water/hr. which later should be evaporated, requiring 2,500 lb. (1,134 kg.) of steam/hr. It has been shown also that by adding a small amount of steam to the cooked material a better coagulation is obtained. Vacuum concentrators are used in S. Africa to treat the stickwater, while in the Scandinavian countries the majority of factories are equipped with drying drums or they return this concentrate with the fish cake. The use of direct, or air lift, driers requires temperatures of about 200° F. (93° C.). During direct heat-drying a great proportion of free ammonia disappears and it is possible to determine which method produces fish meal with a greater amount of this compound. The use of steam driers permits the use of lower temperatures by controlling the amount of air sucked through the equipment, while the capacity of the drier is controlled by regulating the steam pressure and, in consequence, the temperature.


ABSTRACTER: Francisco Hoyos

6.14 THE EFFECT OF PROLONGED HEATING ON VARIOUS NUTRITIVE FACTORS IN FISH MEAL

Rowan, A. N.
Annual Report, Fishing Industry Research Institute, April-December 1956, Cape Town, South Africa, 10, 28-29 (1957)

Purpose. -- Tests were conducted to determine if slightly elevated temperatures over long periods have a greater effect on protein content and nutritional value of fish meals than has over-heating during drying.

Pilchard meal. --Ordinary pilchard meal was well mixed and divided into three portions. One portion was placed in a hermetically sealed container immediately and stored at 32° F., and the other two were kept at approximately 140° and 170° F., respectively, in closed containers for 90 hours. During this period, 20 milliliters of air per minute was passed through the heated meals. At the end of the heating period, the meals were hermetically sealed and stored at 32° F.

There were large decreases in biological value, protein quality index, ether extractable fat, and total fat. On the other hand, the acid hydrolysis fat and indigestible nitrogen rose considerably, the color darkened, and a scorched odor developed. For all of these factors, the effect was greater at 170° F. than at 140° F. Other factors were not appreciably affected. In this test, the heat treatment reduced the nutritive value of the meal markedly, the reduction being greatest at the higher temperature.

Maasbanker meal. --A sample of whole meal kept in a dehydrator at 276° F. for 2 hours and one kept for 5 days at 104° F. showed no significant change in biological value, indigestible protein, protein

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ABSTRACTER: June H. Olden

6.19 FISH BYPRODUCTS

Anonymous
Food Investigation 1957, Report of the Food Investigation Board (Great Britain), pp. 21-22 (1958) (London)

Quality assessment. -- Fish meal is an important source of high-quality protein in animal feed stuffs. Because of variability in quality, fish meal should be graded before sale. This requires the development of rapid chemical or physical tests, the results of which can be correlated with biological feeding tests. The staff of the Torry Station is cooperating with the Agricultural Research Council in the development of these tests. Two proposed methods suggest the need for an improvement in sampling procedure before satisfactory reproducibility of the analytical results can be expected.

Effluent odors. --A practical means is needed for reducing offensive smells that originate in fish-meal plants, particularly herring-meal plants. This study is being supported financially by the Scottish Home Department, the Herring Industry Board, and private industry. Some progress has been made in identifying the more important chemical components of the offensive odors and in testing means of eliminating them.

Fish-meal pilot plant. -- The factors that affect the design and the performance of a continuous steam-jacketed drying plant in the fish-meal industry are numerous. The most important of these factors probably are the ones that affect the transfer of heat through the inner shell of the steam jacket to the material being dried. Steam pressure in the jacket will affect the steam temperature and therefore the transfer of heat. From experiments with a continuous, steam-jacketed pilot plant at Torry Station, a definite relationship was found to exist between the capacity of the plant and the absolute temperature of the steam in the jacket within the steam pressure range of 5 to 45

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ABSTRACTER: Martin Heerdt

6.30 SEAWEEDS AND THEIR USES

Sanford, F. Bruce (U. S. Bureau of Commercial Fisheries, Seattle 2, Washington)
Fishery Leaflet 469, 23 pp. (November 1958) (U. S. Department of the Interior, Bureau of Commercial Fisheries, Washington 25, D. C.)

Introduction. --The products obtained from the seaweeds may be divided into two groups: natural and derived.

The natural products are those in which the seaweed itself is used as the end product. These may be whole, ground, or dried. Such products are used primarily for human food, for animal food, and for fertilizer.

The derived products are those manufactured from seaweeds by chemical processes. Historically these products have included a wide variety of materials, such as iodine, acetone, and decolorizing carbon. The major derived products, both in the present and in the recent past, are those that have the ability to form gels and colloidal suspensions. In the United States, the principal colloidal products made from seaweeds are agar, algin, and carrageenin. Commercially these derived products are vastly more important than are the natural ones.

The major constituents in seaweeds are the carbohydrates; the minor constituents include protein, fat, minerals, and vitamins. Seaweeds have long been used for human food in the Orient, whereas this use in the United States has been relatively unimportant. Seaweed meal, at about the 2- or 3-percent level in the rations of farm animals, is said to produce beneficial results. The meal makes a good fertilizer if suitably supplemented with nitrogen and phosphorus, since it is high in potassium.

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ABSTRACTER: F. Bruce Sanford

FISH MEAL IN S. AFRICA

EFFECT OF HEATING ON MEAL

QUALITY STANDARDS FOR MEAL

USES FOR SEAWEED

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quality index, nitrogen fractions, or fat fractions. The color was not very different from that of pilchard meal in the previous test. The control meal had no scorched odor, but both heated meals had a slightly scorched odor.

Conclusions.--The difference in behavior between the meals used in the two tests may have been due to the fact that they were made from different species of fish or that one was a whole meal and the other was an ordinary meal. The heated meals in the second test, however, lost most of their moisture in the dehydrator. The moisture contents were: original meal, 7.2 percent; meal kept at 276° F. for 2 hours, 0.2 percent; and meal kept at 140° F. for 5 days, 2.4 percent. It is possible that the various factors are changed only if a minimum amount of moisture is present. It would appear from these tests that neither color nor odor can be used as an index of lowered nutritional values.

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During World War I, the California kelp industry produced large quantities of potassium chloride, iodine, decolorizing carbon, and such organic solvents as acetone. The seaweeds represent a tremendous reserve source of potassium chloride and iodine.

Other derived products that can be made from seaweeds include mannitol, an alcohol having 6 OH groups.

The primary economic value of seaweeds is as sources of the phycocolloids--agar, algin, and carrageenin. These materials are used in making bacteriological solid culture media, dental impression molds, and stabalizers for chocolate milk and in manufacturing hundreds of products as diverse as terramycin suspensions and battery-plate separators. Thus the seaweeds--far from being weeds--are exceedingly useful seaplants.

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pounds per square inch gauge.

6.33 STUDIES ON THE BLEACHING AND UTILIZATION OF THE SEAWEED "GULAMAN-DAGAT" (GRACILARIA CONFERVOIDES)

Sulit, J. I.; Salcedo, L. G.; and Panganiban, P. C. (Bureau of Fisheries, Manila, Philippines)
Proceedings Indo-Pacific Fisheries Council, 6th Session, September 30 - October 14, 1955, Section II, pp. 280-283 (1956) (Bangkok)

The study reported here was undertaken to discover the best and quickest means of bleaching gulaman-dagat by chemical methods and to determine the utility of the resulting product.

Bleaching the seaweed.--Kojima (1951) successfully used calcium and sodium hypochlorides to expedite bleaching. He found that potassium permanganate and hydrogen peroxide took a longer time to accomplish the desired effect than did the hypochlorides.

A saturated solution of calcium oxide was used as a preliminary treatment in the sun-bleaching of seaweed. The seaweed was soaked in a saturated solution of calcium oxide for several minutes until the color of the seaweed turned olive green. It then was spread on bamboo mattings and moistened occasionally to facilitate bleaching by the sun. As soon as the seaweed had been thoroughly bleached, it was washed and then was dried in the sun. The whole process of bleaching and drying took 1½ days. The final product was light brown in color. Although the calcium oxide did shorten the time necessary for bleaching the seaweed, it also hardened the plant tissue and made it more difficult to extract the agar.

A strong solution of sodium hypochlorite shortened the time necessary to convert the color of the seaweed to a light green; however, the gel strenght of the agar extract prepared from this seaweed was found to be very low. The weak solution of sodium hypochlorite proved to be better, as shown by the gel strength of the agar prepared from the seaweeds treated with it.

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 ABSTRACTER: Kathryn L. Osterhaug

7.80 RAPID DETERMINATION OF THE QUALITY OF WHOLE EVISCERATED HADDOCK

Proctor, B. E.; Nickerson, J. T. R.; Fazzina, T. L.; Ronsivalli, L.; Smith, R. K.; and Stern, J. (Massachusetts Institute of Technology, Cambridge)
Food Technology 13, 224-227 (April 1959)

This paper is concerned with a method that has been developed for the rapid determination of the fresh quality of whole, eviscerated haddock.

Experimental.--A quantity of whole eviscerated fish, usually 150 pounds, was purchased from a local fisherman and brought to the laboratory less than 24 hours after being caught. The fish were placed in ice in a metal tank fitted with wooden racks and equipped with holes in the bottom so that water from the melting ice would not accumulate around the fish. Approximately 100 pounds of crushed ice was used with each 150 pounds of fish. The tank with the fish and ice was located in a room held at 36° to 40° F. This arrangement provided a temperature of 33° to 34° F. around the fish. In subsequent tests, haddock purchased strictly fresh were placed in MSAT cellophane bags and held in a room at 36° to 40° F.

Six fish were taken from different areas of the tank each day for analysis. The eyes were removed from the head of each fish and were placed in a 100-milliliter (ml.) beaker. A slit was then made in the posterior part of each eye, and the eye fluids were allowed to drain into the beaker. Fluid from the eyes of each fish was transferred to a separate tube and centrifuged. The clear liquid fraction was then strained through a thin mat of glass wool to remove a gel-like component.

Refractive indices were determined at 20° C. on three drops of the clear liquid fraction with an Abbe refractometer.

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 ABSTRACTER: Martin Heerdt

7.50 REPORT ON TOTAL SOLIDS AND ETHER EXTRACT IN FISH AND OTHER MARINE PRODUCTS

Risely, H. M. (Food and Drug Administration, Department of Health, Education, and Welfare, Seattle, Washington)
Journal of the Association of Official Agricultural Chemists 42, 261-262, (May 1959)

Introduction.--No work was done on total solids in fish and other marine products during 1958.

A modified Babcock method for the determination of fat in canned salmon was described and preliminary results reported in Journal of the Association of Official Agricultural Chemists 40, 343 (1957). The method was applied to fishery products other than canned salmon and subjected to collaborative study during 1958.

Determination.--Weigh 9 grams ground and mixed sample into a Paley-type Babcock cheese bottle (Kimble Glass No. 508, 20-percent size), stopper, and add about 30 milliliters of reagent prepared by mixing equal volumes HOAc and 70 to 72 percent $HClO_4$. Place in boiling water bath (stainless steel beaker preferred) and swirl occasionally until digestion is complete (about 20 minutes). Remove from bath, add reagent until fat is well up in calibrated neck of bottle, centrifuge 2 minutes at about 600 r.p.m., and read percent of fat with dividers. If fat falls below calibration, add more reagent, centrifuge 1 minute and read again.

Results.--Results on four collaborative samples by six different analysts are reported and are compared with results by the official A.O.A.C. method.

The modified Babcock method is not suitable for frozen fishery products, but gives consistent

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8.50 BIOCHEMICAL STUDIES ON SOCKEYE SALMON DURING SPAWNING MIGRATION. V. CHOLESTEROL, FAT, PROTEIN, AND WATER IN THE BODY OF THE STANDARD FISH

Idler, D. R. and Bitners, I. (Fisheries Research Board of Canada, Technological Station, Vancouver, B. C.)
Journal of the Fisheries Research Board of Canada 16, 235-241 (March 1959)

Introduction.--Recently, a pure race of Fraser River sockeye salmon (Oncorhynchus nerka) was sampled (1) at Lummi Island, Washington, U. S. A., before the fish entered the Fraser River, (2) at Lillooet, 403 kilometers (km.) up river in British Columbia, and (3) at the end of a 1,135-km. spawning migration in Forfar Creek, B. C. The data showed that the 216 fish taken and the uniformity of the population permitted an accurate designation of a standard sockeye for both sexes. With this technique, not only percentage changes but absolute weight changes in tissue components may be determined.

The first report in this series described the weight and length changes that occurred in all major organs and tissues during spawning migration and discussed the changes in plasma cholesterol and electrolyte levels (Idler and Tsuyuki 1958). Subsequent reports discussed the changes in fat, protein, free and esterified cholesterol, nitrogen compounds, and water in sockeye salmon flesh (Idler and Bitners 1958; Duncan and Tarr 1958; Wood 1958).

The present report (1) discusses the changes in fat, protein, water, and free and esterified cholesterol in the entire eviscerated body of the fish exclusive of the flesh and (2) compares and contrasts these changes with the corresponding changes that occurred in the flesh of the standard fish of either sex. The viscera of Stuart Lake sockeye have been shown to contribute only 2 to 4

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 ABSTRACTER: Martin Heerdt

BLEACHING SEAWEED

ASSAY FOR SOLIDS AND FAT

EYE FLUIDS INDICATE QUALITY

CHANGES IN COMPOSITION OF SALMON

7.50

results with canned salmon and tuna. It should be useful as a rapid sorting method when a precision closer than 0.2 percent is not required. The method was developed as a means of obtaining individual fat determinations on many hundreds of cans of salmon in a relatively short period of time. The natural variation in fat content between different cans of salmon in a given sample is so great (100 percent or more) that a precise method, such as the A.O.A.C. method loses much of its significance in cases in which a large volume of data is needed for statistical analysis.

None of the collaborators experienced any particular difficulty with the method as applied to canned salmon and canned tuna, and most of them agreed that there was a very appreciable saving in time which more than compensated for the slightly higher cost of the reagents, particularly the perchloric acid.

Recommendation.--The author recommends: (1) that the rapid modified Babcock method for fat in canned fish be adopted as first action and (2) that collaborative work on methods for total solids and ether extract in fish and other marine products, other than oysters, be discontinued.

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percent fat and protein (Idler and Clemens, in press).

Methods.--The sockeye salmon were caught in reef nets, anaesthetized in ice water, and bled by severing the caudal artery. The fish were placed in polyethylene bags, stored in dry ice, and partially thawed overnight. The frozen viscera including the kidney then were removed. The head and tail were combined with the bones and the skin, which had been well scraped on the inside, whereas the flesh was kept separate as previously described by Idler and Tsuyuki (1958). The frozen samples were divided into four groups for each sex at each location and were then blended with a silent electric cutter. Representative 1-pound samples were heat processed in enamelled cans and were used for the analysis described in this report. The calorie discussed below is the kilogram-calorie (kc.). The fat and protein discussed below are equivalent, respectively, to 9.3 kc. per gram and to 4.1 kc. per gram. Fat, protein, water, and cholesterol were determined as previously described by Idler and Tsuyuki (1958) and Idler and Bitners (1958).

Changes in percentage composition.--The water content of the combined head, skin, bones, and tail (hereinafter referred to as combined trimmings) was much smaller than that of the flesh for both sexes at Lummi Island and Lillooet. This difference was much smaller at the spawning grounds. The water content of the combined trimmings from both sexes increased even more on a percentage basis than did that of the flesh during the last 750 km. of the migration. The fat content of the combined trimmings from both sexes remained essentially constant throughout the river migration. By contrast, the protein content of the flesh continued to decrease as the fish moved up the river. The ratio of the protein content of the remainder of the body to that of the flesh was similar for both sexes at each of the three locations, averaging 0.74 at Lummi Island, 0.78 at Lillooet, and 0.94 at Forfar Creek.

The total cholesterol levels of the remainder of the body were more than double those of the flesh at all locations for both sexes. Similarly, the ratio of free cholesterol in the remainder of the body to that in the flesh exceeded 2 for both sexes at all locations except Forfar Creek, where the ratio was slightly less than 2.

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Table 2.--Gel strength in milliliters of water of agar extracted from the dried bleached gulaman-dagat with various amounts of 1/10 $NH_2SO_4$

| Treatment of seaweeds | Gel strength of extracted agar | | | |
|---|---|---|---|---|
| | 0 ml. acid | 5 ml. acid | 10 ml. acid | 15 ml. acid |
| 1. No treatment (control) | 17.1 | 13.8 | 14.2 | 20.2 |
| 2. Saturated calcium hydroxide solution | 2.40 | 5.75 | 8.10 | 7.30 |
| 3. Strong sodium hypochlorite solution | 10.20 | 7.10 | 3.30 | 3.10 |
| 4. Sodium hypochlorite (1:10) | 15.80 | 8.50 | 5.30 | 5.60 |
| 5. Sodium hypochlorite (1:50) | 27.70 | 25.20 | 26.40 | 26.70 |

7.80

To determine the optical density, 2 ml. of the clear liquid fraction was placed in a lumetron tube and diluted with 8 ml. of Beckmann No. 3501 buffer, which has a pH of 7. The optical density of the clear liquid fraction was measured in a lumetron colorimeter at a wave length of 420 mμ. Distilled water was used as a blank. For the organoleptic tests, the iced fish were filleted and cut into 50-gram portions, and the middle portion of each fillet was prepared. The portions of fish were placed in crystallizing dishes, covered with inverted crystallizing dishes of larger size, cooked for 20 minutes in an electric oven at 400° F., and evaluated by a test panel of five members.

A fish-extract agar prepared by dissolving 25 grams of tryptose glucose extract agar in a fish extract was used as a bacteriological media for the examination of fish-eye fluids. One eye was removed from each fish, washed with 80-percent ethyl alcohol, and pierced with a scalpel. A pipette was inserted, and 1 ml. of eye fluid was withdrawn and diluted with 9 ml. of sterile water. Further dilutions were prepared from the 1-to-10 dilution. The various dilutions of eye fluids were cultured on fish-extract agar medium in petri dishes for 5 days at 20° C. before counts were made. Trimethylamine nitrogen determinations were made on fish-flesh samples according to the method of Dyer. Refractive index and optical density values for the eye fluids of fish were obtained by an investigator who sampled the fish immediately after removal from the water and at 3-, 6-, and 8-hour periods after removal from the water.

Results.--The refractive index of haddock eye fluids was found to correlate (1) with the organoleptic scores of the cooked flesh from the same fish and (2) with the time of storage at refrigerator temperatures above freezing. Optical density values for haddock eye fluids were not as suitable as were the refractive index values for the measurement of quality. Changes in the physical properties of haddock eye fluids during storage at temperatures above freezing are proabably due to enzyme action, since evidence of bacterial decomposition was not obtained. This work was done under contract with the Bureau of Commercial Fisheries with funds provided by the Saltonstall-Kennedy Act of 1954.

8.51 THE AMINO-ACID COMPOSITION OF SOME BRITISH FOOD FISHES

Connell, J. J. and Howgate, P. F. (Torry Research Station, Aberdeen, Scotland)
Journal of the Science of Food and Agriculture 10, 241-244 (April 1959)

Material.--Cod (Gadus callarias), haddock (G. aeglefinus), lemon sole (Pleuronectes microphalus), and herring (Clupea harengus)--caught in the North Sea during May and held for 3 days in ice before being filleted--were used for analysis. Flesh from six fish of each species, as completely free of skin and bones as possible, was coarsely chopped and well mixed. The protein of the flesh was separated from the nitrogeneous extractives by macerating 50 grams of mince with 160 milliliters (ml.) of absolute ethyl alcohol, filtering off the precipitate, and re-extracting it with 160 ml. of 80 percent, volume-for-volume, aqueous ethyl alcohol. The precipitated protein was collected by filtration, air-dried, continuously extracted for 6 hours with ether, air-dried again, and ground. On an ash- and moisture-free basis, cod, haddock, lemon sole, and herring protein powders contained, respectively, 16.77, 16.83, 16.86, and 16.80 percent nitrogen and 1.10, 1.08, 1.0, and 1.12 percent sulfur.

Methods.--Samples were hydrolyzed with about 40 times their weight of constant-boiling HCl in sealed, evacuated Pyrex tubes held constantly at 110° C. for 24 hours, suitably diluted, and treated to remove the bulk of the HCl. Amino acids were separated on columns of powdered Amberlite IR-120 ion-exchange resin of less than 200 mesh in size. Acid and neutral amino acids were eluted at 50° C. from 0.9 centimeter (cm.) by 150-cm. columns, whereas basic amino acids were eluted from 0.9 cm. by 15-cm. columns. Fractions of the eluate were analyzed by the method of Moore and Stein (1954) with the exception that a solution of 0.08 percent stannous chloride by weight was used as a reducing agent. Tryptophan was determined directly on the samples by the method of Spies and Chambers (1949). Cysteine plus cystine was digested by performic acid oxidation, hydrolyzed, and determined as cysteic acid on a 0.9 cm. by 15 cm. column of IR-120 resin. Amide nitrogen was determined by the method of Chibnall et al. (1958) except that the ammonia nitrogen was determined separately. Values obtained directly from the chromatographic analysis of the hydrolyzates are tabulated (see over).

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ABSTRACTER: Martin Heerdt

8.6177 STUDIES ON SHARK LIVER OIL. PART 1. PHYSICOCHEMICAL CONSTANTSS AND VITAMIN A CONTENT OF LIVER OIL FROM SHARKS OFF THE KARACHI COAST

Maqsood, Ali S.; Abdul, Haq. S.; and Mahdihassan, S.
Pakistan Journal of Scientific and Industrial Research 1, No. 1, p. 70 (Jan. 1958) (In English)
World Fisheries Abstracts 10, 43-44 (March-April 1959)

According to the statistics collected by the Pakistan Central Fisheries Department, the present landing of sharks has been continuous over a period of years and stands around 10,000 tons p.a. A considerable amount of shark meat is dried, cured, and exported, but the liver oil is extracted in a very crude manner, resulting in a dark colored, obnoxious-smelling product, which is mainly used for smearing fishing boats. Systematic investigations on the problem of shark-liver oil production in Pakistan were taken up. The present paper deals with the yields and the physicochemical characteristics of the oils from different species of sharks and their vitamin A content in relation to age, size, and sex of the fish. While the liver oil of sharks found in Indian waters has been studied by various workers, sharks of the Karachi coastal waters have not been paid much attention, and there are only a few isolated references on the yields of their liver oil and its vitamin A content.

In the course of the present studies the following conclusions have been arrived at: (1) The oil extracted from various species of sharks contains from 2,000 to 72,000 U.S.P. units of vitamin A/g., which is a much higher average than is noted for the liver oil of sharks from any other coastal area of the subcontinent. This is perhaps due to the superabundance of prawns and shrimps on the Karachi coast and the comparative dearth of this important fish food near Bombay. (2) Hammerhead shark (Sphyrna malleus) is the richest source of vitamin A. Its liver oil contains up to 72,000 U.S.P. units of vitamin A/g. The yield of oil from adult sharks ranges from 21 to 46 percent of the weight of fresh liver. Liver of males has a higher vitamin content than that of females. (3) Maturity of the

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8.59 MULTIPLE HEMOGLOBINS IN FISHES

Bühler, Donald R. and Shanks, Warren E. (U. S. Fish and Wildlife Service, Cook, Washington)
Science 129, 899-900 (April 3, 1959)

Introduction.--Since the demonstration of abnormal hemoglobin in man by Pauling and his co-workers (1949), electrophoretic studies have been carried out on many other species. Manwell (1957) recently reported a difference in alkaline denaturation between adult and postlarval hemoglobins from a teleost fish (Scorpaenichthys marmoratus). Examination of fish hemoglobins should therefore reveal some differences that may be species characteristics and perhaps even dependent upon race.

Experimental.--Samples of fish blood were collected in heparinized tubes, either by cardiac puncture of the larger fish or by amputating the peduncle of smaller fish and collecting the droplets of blood from the severed caudal vein and artery. The red cells were separated from the plasma by centrifugation and then washed three times with 0.9-percent sodium chloride. The hemoglobin solutions used for analysis were prepared by adding 2 volumes of distilled water to 1 volume of packed red cells. After standing overnight in the cold, the hemolyzates were centrifuged at 25,000 times gravity for 1 hour. The supernatant fluid, after centrifugation, was stored at -10° C. Paper electrophoresis was performed in a Spinco model R apparatus at 6 milliamperes for 6 hours; S and S 2043A paper with sodium barbital buffer (pH 8.8; ionic strength, 0.05) was used. Preliminary experiments had established that maximum separation occurred under these conditions. The electrophoregrams were scanned photometrically by means of a Photovolt densitometer, model 525, equipped with either a 420 or a 540 mμ filter. Moving-boundary electrophoresis of dialyzed hemoglobins was carried out at 10 milliamperes in sodium barbital buffer (pH 8.6; ionic strength, 0.1) in a Perkin-Elmer model 38 apparatus operating at approximately 180 volts.

Results.--The mobilities at pH 8.8 of hemoglobin from 14 species of fish are compared with that

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9.7 FISHERIES EDUCATION IN NORWAY

Myklebust, Bjørn
Norwegian Fishing News 6, No. 1, 5-6 (1959) (Bergen, Norway)

In Norway, the following training programs are open to fishermen: (1) five state fisheries schools, (2) one district fisheries school, (3) one school for teaching the processing and handling of fish, and (4) shorter ambulatory courses including (a) navigation--2½ months' duration, (b) radio telephony--2 weeks' duration, (c) bookkeeping, (d) care of electric equipment on board fishing vessels, (e) echol sounder--1 weeks' duration, (f) fish processing, and (g) first aid.

The students of the fisheries schools are young fishermen, generally between the ages of 17 and 30, who have been through the 7-year elementary school, which is compulsory for all children in Norway. Regardless of their economic resources, all of the students are provided free travel to and from school, free tuition, and free board while at school. The students lodge at school and have their meals there.

The courses at the state fisheries schools are stringent. During the 10 months' course for fisheries skippers, the students must concentrate on their work incessantly, which leaves them very little time for recreation. The lectures cover 20 theoretical and 6 practical subjects.

The following subjects are covered in the skipper course:

| | Periods | | Periods |
|---|---|---|---|
| Navigation | 430 | Engines (motors) | 30 |
| Mathematics | 80 | Seamanship | 20 |

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ABSTRACTER: Kathryn L. Osterhaug

8.59

of human hemoglobin A, which served as a reference standard. Although many samples have been examined in this manner, no gross differences in mobilities have been detected in a given species with regard to sex, age, or race. Percentage distribution of the hemoglobin, as determined by planimetry of the densitometer recordings, is given in table 1 (see below) for those species possessing more than one hemoglobin component. In general, the largest component appears to have the highest mobility.

Conclusions.--It is interesting to note that many fish hemoglobins are characterized by a low anodal mobility at pH 8.8 and are consequently shifted to the cathode side of the origin by the electroosmotic buffer flow. Mobility measurements made from moving-boundary electrophoresis patterns showed, for example, that at pH 8.6 the mobilities of the three hemoglobin components of rainbow trout were $-2.39 \times 10^{-5}$, $-1.24 \times 10^{-5}$, and $0.70 \times 10^{-5}$ cm.$^2$/volts second.

Table 1.--Relative distribution of fish hemoglobin components. Values are averages of two fish of each species.

| Electrophoregram | Fish species | Percentage of total hemoglobin | | |
|---|---|---|---|---|
| | | Highest mobility | Medium mobility | Lowest mobility |
| | | Percent | Percent | Percent |
| E | Steelhead trout | 54-56 | 22-23 | 22-23 |
| F | Rainbow trout | 54-58 | 21-23 | 21-23 |
| G | Blueback salmon | 51-53 | | 47-49 |
| H | Shad | 66-70 | | 30-34 |
| I | Largemouthed bass | 60-64 | | 36-40 |
| J | Brook trout | 56-64 | 18-22 | 18-22 |
| K | Silver salmon | 50-60 | | 40-50 |
| L | Chinook salmon | 50-60 | | 40-50 |

8.51

The amino acid compositions of the flesh of four British food fishes

| | g. of amino acid N/100 g. of protein N | | | | g. of amino acid/100 g. of protein | | | |
|---|---|---|---|---|---|---|---|---|
| | Cod | Haddock | Lemon sole | Herring | Cod | Haddock | Lemon sole | Herring |
| Asparatic acid | 6.68 | 7.29 | 7.40 | 6.87 | 10.64 | 11.61 | 11.80 | 10.95 |
| Threonine | 3.52 | 3.86 | 3.81 | 3.57 | 5.26* | 5.79* | 5.70* | 5.34* |
| Serine | 3.74 | 4.25 | 4.32 | 3.92 | 5.38* | 6.11* | 6.05* | 5.63* |
| Glutemic acid | 9.38 | 9.85 | 9.43 | 9.60 | 16.57 | 17.40 | 16.65 | 16.95 |
| Proline | 3.04 | 3.09 | 3.42 | 3.18 | 4.20 | 4.27 | 4.73 | 4.40 |
| Glycine | 5.65 | 5.79 | 5.56 | 5.64 | 5.08 | 5.20 | 5.00 | 5.06 |
| Alanine | 6.75 | 6.56 | 6.52 | 6.90 | 7.19 | 6.99 | 6.94 | 7.35 |
| Valine | 4.12 | 4.04 | 4.16 | 4.27 | 5.79 | 5.68 | 5.85 | 6.00 |
| Methionine | 1.16 | 1.81 | 1.92 | 1.13 | 2.07 | 3.22 | 3.42 | 2.02 |
| Isoleucine | 3.10 | 3.09 | 3.48 | 3.23 | 4.88 | 4.68 | 5.47 | 5.09 |
| Luecine | 5.92 | 5.92 | 5.52 | 6.10 | 9.31 | 9.31 | 8.70 | 9.59 |
| Tyrosine | 1.86 | 1.96 | 1.88 | 1.89 | 4.04 | 4.25 | 4.08 | 4.10 |
| Phenylalanine | 2.36 | 2.36 | 2.45 | 2.39 | 4.67 | 4.67 | 4.85 | 4.73 |
| Lysine | 11.78 | 12.58 | 12.22 | 11.70 | 10.32 | 11.02 | 10.73 | 10.29 |
| Histidine | 3.86 | 4.09 | 4.02 | 4.10 | 3.47 | 3.67 | 3.62 | 3.69 |
| Arginine | 12.88 | 13.36 | 12.91 | 14.02 | 6.74 | 6.99 | 6.76 | 7.33 |
| Cystine/2 | 0.98 | 0.95 | 0.99 | 0.98 | 1.42 | 1.38 | 1.44 | 1.42 |
| Tryptophan | 1.08 | 1.17 | 1.28 | 1.15 | 1.32 | 1.43 | 1.56 | 1.41 |
| Amide | 6.76 | 7.00 | 6.83 | 6.54 | | | | |
| Total | 94.62 | 99.02 | 98.01 | 97.18 | | | | |

*Corrected for hydrolytic losses with factors of 100/95 and 100/90, respectively.

9.7

| | Periods | | Periods |
|---|---|---|---|
| Rules of the road sea | 40 | Signalling | 30 |
| Meteorology | 20 | Maritime law | 20 |
| Norwegian and English | 205 | Health and sanitation | 20 |
| Oceanography | 60 | Bookkeeping | 55 |
| Chemistry and physics with electricity | 70 | Radio telephony | 65 |
| Sociology, cooperation | 20 | Metal work | 30 |
| Statistics | 10 | Tackle and gear work | 45 |
| Echo-sounders | 10 | Electrical fit-up | 10 |
| Radio bearings | 10 | Fishery biology | 90 |
| Practical fisheries | 90 | Zoology and botany | 60 |
| | | | 1,535 |

The state fisheries schools offer three courses: (1) the fishery skipper course, (2) motor maintenance, and (3) cookery.

In the motor maintenance course, the students are taught how to run the engines of a fishing vessel and how to take care of the electrical equipment on board. The following subjects are taught as a part of this course: the reading and writing of Norwegian, mathematics, physics, chemistry, motors, electricity, materials, metal work, and engine drawings.

8.6177

fish and size of the liver have an important bearing on the yield of oil. Large livers weighing 6 lb. (2.7 kg.) or more yield 30 to 65 percent; and small livers, only 8 to 25 percent of oil. (4) The chemical constants of the oil, such as iodine value, saponification value, and the percentage of unsaponifiable matter significantly vary with the difference species of sharks, whereas physical constants--that is, specific gravity and refractive index--show only slight differences. No correlation was found between any of the physicochemical constants and vitamin A potency. The unsaponifiable matter of the oil has a much lower percentage (1.3 to 10.9 percent) compared to liver oils of sharks of the Atlantic and Pacific coasts, for which up to 90 percent has been recorded.

The shark was identified, and the necessary data regarding the sex, approximate body weight, the weight of the liver, and length of the fish were noted. The liver was brought to the laboratory and, after removing blood, gall bladder, etc., was minced in a mincing machine. Weighed quantity of liver was mixed with twice its weight of hot water and digested for about 45 min. at 80° to 85° C. (176° to 185° F.). The mixture was allowed to stand for some time in a separating funnel. The lower layer of water was removed, and the oil along with the liver tissue was centrifuged. The oil thus separated was finally dried over anhydrous sodium sulphate and filtered hot into a tared flask. Vitamin A was determined spectro-photometrically, and physicochemical characteristics of the oil were determined by standard methods and are recorded in a table.

0.33 DRYING

Anonymous
Food Investigation 1957, Report of the Food Investigation Board (Great Britain), pp. 19-20 (1958)

(Abstract of this article appears under 3,6 page 9 - August 1959)

0.33 BIOCHEMICAL STUDIES ON THE FISH BLOOD XIII. ON THE ELECTROPHORETIC SPECIFICITY OF SERUM LIPOPROTEIN AND GLUCOPROTEIN

Saito, Kaname
Bulletin of the Japanese Society of Scientific Fisheries 24, Nos. 6 and 7, 531-534 (1958) (English abstract and figures)

Serum protein, isolated from fish by paper electrophoresis, contained glucoprotein as well as lipoprotein, which were detected by the periodic acid Schiff reaction and sudan black-B reaction, respectively. Lipoprotein and glucoprotein reactions were positively found in an albumen-like fraction of high mobility that was obtained from the serum protein of teleosts such as carp, gray mullet, or red snapper. In elasmobranchs like shark and ray, these same protein reactions occurred in a fraction of lower relative mobility.

0.5 STUDIES ON GROWTH AND TOXIN PRODUCTION OF CLOSTRIDIUM BOTULINUM TYPE E IN FISH PRODUCTS

Ando, Yoshiaki and Inoue, Katuhiro
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 8, 682-686 (1958) (English abstract and tables)

II. On the nutritional requirements of Clostridium botulinum Type E. -- Type E organisms were unable to grow in media free from sugars, whereas types A and B grew well in this media. Trypsinized preparations of various proteins promoted growth.

0.5 INFLUENCE OF pH ON MICROBIAL DEAMINATIONS

Bouisset, L.; Breuillaud, J.; and de la Roy, Y de Rautlin (Fac. med., Toulouse, France)
Compt. rend. soc. biol. 152, 867-70 (1958)
Chemical Abstracts 53, 7310b (April 25, 1959)

A strain of Escherichia coli (from oyster juice) was grown in a peptone medium. The rate of production of $NH_3$, presumably by action of amino acid deaminases, increased with increase in pH from 5.7 up to pH 7.2 and remained stationary at pH 7.2 to 8.8. Production of indole (presumably by tryptophanase) was nil at pH 4.4, small compared with $NH_3$ at pH 5.7 to 6.2, and more abundant at pH 7.2 to 9.1.

1.0145 HIGH-SEAS FISHERIES OF THE U. S. S. R.

Garfield, Morton J. (Division of Industrial Research and Services, Bureau of Commercial Fisheries)
Fishery Leaflet 482, 12 pp. (March 1959) (Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington 25, D. C.)

1.0146 BRITISH MARINE FISHES

Anonymous
Nature 183, 140 (January 17, 1959)

The Observer's Book of Sea Fishes, by A. Laurence Wells, 160 pp. plus 64 plates, Frederick Warne and Co. (London and New York) (1958), permits identification of the fishes commonly found in British seas.

3.2342 TECHNICAL NOTE NO. 44.--INDUSTRY TESTS SHOW BRINE-FROZEN HADDOCK TO BE OF GOOD QUALITY

Slavin, Joseph W. (Fishery Technological Laboratory, East Boston, Massachusetts)
Commercial Fisheries Review 20, 21 (June 1958)

Practical commercial tests now in progress show that whole and eviscerated haddock brine-frozen at sea and kept in frozen storage for 8 months, produced good-quality marketable frozen fillets. This test is being continued further to see if the frozen fish can be held even longer in cold storage and still produce fillets of high quality.

3.2342 SALT CONTENT OF EVISCERATED HADDOCK FROZEN IN SODIUM-CHLORIDE BRINE

Peters, John A.
Commercial Fisheries Review 21, 6-9 (February 1959)

(Abstract of this article appears under 2,118 page 5 - July 1959)

# ADDRESSES OF PUBLICATIONS ABSTRACTED FOR COMMERCIAL FISHERIES ABSTRACTS

## DOMESTIC PUBLICATIONS

Analytical Chemistry
American Chemical Society
20th & Northampton Streets
Easton, Pennsylvania

Archives of Biochemistry & Biophysics
Academic Press, Inc.
Prince & Lemon Streets
Lancaster, Pennsylvania

ASHRAE Journal
American Society of Refrigerating and Air-Conditioning Engineers, Inc.
234 Fifth Avenue
New York 1, New York

California Fish and Game
Editor
Department of Fish and Game
722 Capitol Avenue
Sacramento 14, California

Chemical Abstracts
American Chemical Society
20th & Northampton Streets
Easton, Pennsylvania

Chemical and Engineering News
American Chemical Society
20th & Northampton Streets
Easton, Pennsylvania

Chemical Engineering
McGraw-Hill Publishing Co.
330 W. 42nd Street
New York, New York

Chemical Processing
Putman Publishing Co.
111 East Delaware Place
Chicago 11, Illinois

Commercial Fisheries Review
Director, Bureau of Commercial Fisheries
Division of Industrial Research and Services
Fish and Wildlife Service
Department of the Interior
Washington 25, D. C.

Drug and Cosmetic Industry
Drug Markets, Inc.
101 W. 31st Street
New York, New York

Federation Proceedings
Federation of American Societies for Experimental Biology
9650 Wisconsin Street
Washington 14, D. C.

Feed Bag, The
Editorial Service Company
1712 West St. Paul Avenue
Milwaukee 3, Wisconsin

Feedstuffs
Miller Publishing Co.
118 South 6th Street
Minneapolis 2, Minnesota

Fish Boat, The
H. L. Peace Publications
624 Gravier Street
New Orleans 12, Louisiana

Fishing Gazette
Fishing Gazette Publishing Corp.
461 Eighth Avenue
New York, New York

Food Engineering
McGraw-Hill Publishing Co., Inc.
330 W. 42nd Street
New York 18, New York

Food Processing
Putman Publishing Co.
111 East Delaware Place
Chicago 11, Illinois

Food Research
The Garrard Press
510 North Hickory Street
Champaign, Illinois

Food Technology
Institute of Food Technologists
11606 South Bell Avenue
Chicago 43, Illinois

Frosted Food Field
Frosted Food Field, Inc.
19 W. 44th Street
New York 18, New York

Industrial and Engineering Chemistry
American Chemical Society
1155 - 16th Street, N. W.
Washington 6, D. C.

Industrial Refrigeration
Nickerson & Collins Co.
433-435 N. Waller Avenue
Chicago, Illinois

Journal of Agricultural and Food Chemistry
American Chemical Society
20th & Northampton Streets
Easton, Pennsylvania

Journal of the American Chemical Society
American Chemical Society
1155 - 16th Street, N. W.
Washington 6, D. C.

Journal of the American Dietetic Association
American Dietetic Association
620 North Michigan Avenue
Chicago 11, Illinois

Journal of the American Oil Chemists' Society
The American Oil Chemists' Society
35 E. Wacker Drive
Chicago 1, Illinois

Journal of the Association of Official Agricultural Chemists
Association of Official Agricultural Chemists
P. O. Box 540
Benjamin Franklin Station
Washington, D. C.

Journal of Biological Chemistry
The American Society of Biological Chemists, Inc.
Mt. Royal & Guilford Avenues
Baltimore, Maryland

Journal of Nutrition
The Wistar Institute of Anatomy & Biology
36th St. at Spruce
Philadelphia 4, Pennsylvania

Journal of Organic Chemistry
American Chemical Society
20th & Northampton Streets
Easton, Pennsylvania

Maine Coast Fisherman
Maine Coast Fisherman, Inc.
Belfast, Maine

Modern Packaging
Modern Packaging Corporation
575 Madison Avenue
New York 22, New York

National Fisherman
Atlantic Fisherman, Inc.
Goffstown, New Hampshire

National Provisioner
National Provisioner, Inc.
15 W. Huron Street
Chicago 10, Illinois

Nutrition Reviews
Nutrition Foundation, Inc.
99 Park Avenue
New York 16, New York

Pacific Fisherman
Miller Freeman Publishing, Inc.
500 Howard Street
San Francisco 5, California

Poultry Science
Poultry Science Association
Kansas State College
Manhattan, Kansas

Progressive Fish-Culturist
U. S. Department of the Interior
Bureau of Sport Fisheries and Wildlife
Fish and Wildlife Service
Washington 25, D. C.

Quick Frozen Foods
E. W. Williams Publishing, Inc.
82 Wall Street
New York 5, New York

Science
American Association for the Advancement of Science at the Business Press
1515 Massachusetts Avenue, N. W.
Washington 5, D. C.

Seafood Merchandising
H. L. Peace Publications
624 Gravier Street
New Orleans 9, Louisiana

Western Canner/Packer
The Canner Publishing Co.
817 West Market Street
Louisville, Kentucky

Western Feed & Seed
Western States Publications
320 Market Street
San Francisco 11, California

## FOREIGN PUBLICATIONS

Analyst, The
14 Belgrave Square
London, S. W., 1, England

Annual Report of the Fisheries Research Board of Canada
Fisheries Research Board of Canada
Ottawa, Ontario, Canada

Biochemical Journal, The
Cambridge University Press
Bentley House
200 Euston Road
London, N. W., 1, England

Biochemistry
(Publication of the Academy of Sciences of the USSR)
Consultants Bureau, Inc.
227 W. 17th Street
New York 11, New York

Bulletin of the Japanese Society of Scientific Fisheries
Japanese Society of Scientific Fisheries
c/o Tokyo Suisan Daigaku
Shiba-kaigandori 6-Chome
Tokyo, Japan

Bulletin of the Faculty of Fisheries, Hokkaido University
Faculty of Fisheries
Hokkaido University
Hakadote, Japan

Canadian Fisherman
National Business Publications, Ltd.
Gardenvale, Quebec, Canada

Canadian Journal of Biochemistry & Physiology
Division of Administration and Awards
National Research Council
Ottawa 2, Ontario, Canada

Canadian Journal of Chemical Engineering
The Chemical Institute of Canada
18 Rideau Street
Ottawa 2, Ontario, Canada

Canadian Journal of Chemistry
Division of Administration and Awards
National Research Council
Ottawa 2, Ontario, Canada

Chemistry & Industry
14 Belgrave Square
London, W., 1, England

Fette-Seifen-Anstrichmittel
Industrieverlag von Hernhaussen KG
Hamburg 11, West Germany

Fisheries Newsletter
Commonwealth Director of Fisheries, Department of Primary Industry
Canberra, Australia

Food Manufacture
Leonard Hill, Ltd.
Eden Street
London, N. W., 1, England

Food Preservation Quarterly
Division of Food Preservation and Transport
Commonwealth Scientific and Industrial Research Organization
Sydney, Australia

Journal of Applied Chemistry
The Society of Chemical Industry
14 Belgrave Square
London, S. W., 1, England

Journal of the Fisheries Research Board of Canada
University of Toronto Press
Ottawa, Ontario, Canada

Journal of the Science of Food and Agriculture
The Society of Chemical Industry
14 Belgrave Square
London, S. W., 1, England

Modern Refrigeration
Maclaren House
131 Great Suffolk Street
London, S. E., 1, England

Nature
MacMillan & Co., Ltd.
St. Martin's Street
London, W. C., 2, England

Norwegian Fishing News
Kaigaten 8
P. O. Box 222
Bergen, Norway

Progress Reports of Atlantic Coast Stations
Fisheries Research Board of Can.
St. Andrews, New Brunswick, Can.

Progress Reports of Pacific Coast Stations
Technological Station
898 Richards Street
Vancouver 2, B. C., Canada

Report of the Food Investigation Board (Great Britain)
Department of Scientific and Industrial Research
Charles House
5-11 Regent Street
London, S. W., 1, England

Trade News
Director of Information and Educational Service
Department of Fisheries
Ottawa, Ontario, Canada

Western Fisheries
Roy Wrigley Publications, Ltd.
1104 Hornby Street
Vancouver 1, B. C., Canada

World Fisheries Abstracts
FAO Fisheries Division
Technology Branch
Viale delle Terme di Caracalla
Rome, Italy

World Fishing
John Trundell, Ltd.
St. Richards House
Eversholt Street
London, N. W., 1, England

3.331 PRODUCTION AND IDENTIFICATION OF A GREEN PIGMENT FORMED DURING IRRADIATION OF MEAT EXTRACTS

Fox, J. B., Jr.; Strehler, Theodora; Bernofsky, Carl; and Schweigert, B. S.
Journal of Agricultural and Food Chemistry 6, 692-696 (September 1958)

(Abstract of this article appears under 0.33 page 7 - January 1959)

3.331 STUDY ON THE GREEN MEAT OF TUNA

Hirao, Shuichi; Murayama, Shigeo; Yanase, Masaaki; Yamada, Juami; Kikuchi, Ryo; Tabei, Kikuko; Kisaka, Kenji; and Enomoto, Yoshihiro
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 8, 671-675 (1958) (English abstract, tables, and figures)

I. Quantitative differences of the vitamin B group and minerals between the green and the normal meat of precooked tuna.--In comparison with normal meat, green meat is rich in moisture and vitamin $B_{12}$ and poor in vitamin $B_6$.

II. Quantitative differences of the vitamin B group and minerals in kidney between green and normal bodies of yellowfin tuna.--Ibid. 676-678. In comparison with normally colored fish, kidney from green tuna was found to contain a larger amount of moisture and less phosphorus with a very low ratio of P to Ca.

III. A simple method to distinguish greened body from normal one before cooking.--Ibid. 679-681. Water suspension of kidney tissue is colored light brown, in the case of normal tuna, and brownish black in green tuna.

3.4 SMOKE-CURING PROCESSES

Tilgner, Damazy Jerzy (Politech., Gdansk, Poland)
Fleischwirtschaft 10, 649-57 (1958)
Chemical Abstracts 53, 1577e (January 25, 1959)

The smoke content of meat and fish may be of particular concern because of carcinogenic compounds which may be deposited if processing conditions are not closely controlled. Benzpyrene and dibenzanthracene are among the carcinogenic compounds present in smoke. The amount of benzpyrene in the product depends upon the type and fat content of the casing as well as the type of smoke system used.

3.4 3,4-BENZOPYRENE IN SOME VARIETIES OF SMOKED FISH (FLUORESCENT-SPECTRAL ANALYSIS)

Gorelova, N. D. and Dikun, P. P. (Inst. Oncol., Leningrad)
Voprosy Onkol. 4, 398-405 (1958)
Chemical Abstracts 53, 6472h (April 10, 1959)

Results showed that smoke used for preparation of smoked fish contained 3,4-benzopyrene. The 3,4-benzopyrene carried by the smoke was capable of penetrating deep into the treated product. No analytically different results were found in fish smoked by the hot or cold processes.

3.5 THE OCCURRENCE OF RANCIDITY IN SALT HERRING

Marcuse, R.
Fette, Seifen, Anstrichmittel 60, 482-7 (1958)
Chemical Abstracts 52, 18951 (November 10, 1958)

The tendency of salt herring to turn rancid during storage can be estimated by determining the O uptake in the presence of oxidation inhibitors. The addition of 0.01 to 0.02 percent propyl gallate showed a marked inhibiting effect.

3.5 THE TECHNOLOGICAL CHARACTERISTIC OF THE BALTIC SEA CODFISH

Pozhogina, P. M.
Izvest. Akad. Nauk Latv. S.S.R. No. 3, 85-91 (1954)
Referat. Zhur. Khim. Abstr. No. 49303 (1956)
Chemical Abstracts 53, 2502e (February 10, 1959)

Data are cited on the chemical compound of the common codfish caught from March to September in the open part of the Baltic Sea and in the Gulf of Riga. Weight changes and relations are discussed. The seasonal changes of the sex products and the liver are characteristic. The chemical compound of the meat of the codfish is practically unchanged owing to location or season.

4.11 DETERMINATION OF FATTY ACIDS IN SMALL AMOUNTS OF PLASMA AND IN LIPIDE COMPONENTS OF TISSUES BY ULTRAVIOLET SPECTROSCOPY

Riemenschneider, Roy W.; Luddy, Francis E.; and Morris, Stewart G. (Eastern Utilization Research and Develop. Div., Philadelphia, Pa.)
Am. J. Clin. Nutrition 6, 587-9 (1958)
Chemical Abstracts 53, 3342b (February 25, 1959)

Polyunsaturated fatty acids were determined in 1 ml. or less of plasma and in small fractions obtained in separation of tissue lipide components. Detailed methods are given and comparison between micro- and macro-methods are made.

4.11 ISOLATION AND DETERMINATION OF VARIOUS LIPIDIC CONSTITUENTS IN ONE CUBIC CENTIMETER OF PLASMA

Houget, Jacques and Bouton, Gabrielle (Inst. biol. phys. chim., Paris)
Bull. soc. chim. biol. 40, 1663-76 (1958)
Chemical Abstracts 53, 5374g (March 25, 1959)

Methods are described for extracting lipides from 1 cc. of plasma and determining total fatty acids and those of glycerides, steroids, and phosphatides, lipide-P, and free and esterified cholesterol. Estimations and analyses are within 3 percent error.

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6.135 EXPERIENCE AND METHOD OF CONTROLLING ODORS ASSOCIATED WITH FISH BYPRODUCTS PLANT AT GLOUCESTER

Mandell, Leonard D. (Consulting Research Engr., Providence, R. I.)
J. Boston Soc. Civil Engrs. 45, 366-8 (1958)
Chemical Abstracts 53, 6472g (April 10, 1959)

The plant-odor-control equipment is designed for a raw fish rate of 30 tons per hour. The sources of community odor problems are discussed. Aldehyde and organic nitrogen concentrations in atmosphere discharges are good criteria for potential odor indexes. Sulphur gases ($H_2S$ and mercaptans) are not of concern from this plant.

6.135 DEODORIZATION OF FISH-LIVER OIL

Kanai, Masakuni
Japan 3632 (May 12, 1958)
Chemical Abstracts 53, 8668e (May 10, 1959)

Fish-liver oil is placed in a vessel with a semipermeable membrane with carbon electrodes 3 to 5 centimeters apart on each side of the membrane, and direct current at 200 volts is applied. Odorous components, such as low-molecular protein hydrolyzate and unsaturated organic compounds, are allowed to move into the cathode chamber, while an odorless fish-liver oil is collected in the anode chamber.

6.190 BIOLOGICAL VALUE OF THE PROTEIN IN SOME SEAFOODS USED IN SPAIN

Pujol, A. and Varela, G. (Univ. Madrid)
Anales bromatol (Madrid) 10, 437-78 (1958)
Chemical Abstracts 53, 5533i (March 25, 1959)

Net protein utilization and nutritive value per kg. were investigated in seafoods by rat-feeding tests (Mitchell method). The seafoods were hake and croaker (fresh and frozen), salt cod, angler, lobster, shrimp, clam, cuttlefish, and squid. Taking net protein utilization of powdered egg as 100, average biological value was highest for hake (fresh 88.8, frozen 88.3) and lowest for shrimp (74.0). Freezing croaker caused a larger loss (87.9 to 85.4). Salt cod (82.2) is not compared with fresh cod. Clams (77.7) were next to last; all other ratings were above 81.0.

6.190 EVALUATION OF PROTEINS IN FOODS 1. A METHOD FOR THE DETERMINATION OF PROTEIN EFFICIENCY RATIOS

Chapman, D. G.; Castillo, Raul; and Campbell, J. A.
Canadian Journal of Biochemistry and Physiology 37, 679-686 (May 1959)

The protein efficiency ratio (P.E.R.) or grams of protein consumed per gram of gain was measured under standardized conditions by feeding 20- to 23-day-old male rats ad libitum an otherwise adequate reference diet containing 10 percent protein supplied by a standard sample of casein. Foods to be assayed are added to the diet as the sole source of protein at the expense of casein to maintain a protein level of 10 percent. After 4 weeks, P.E.R.'s are calculated and adjusted to a value of 2.5 for casein. This is an equally sensitive and simpler method for evaluating protein quality than determination of net protein retention of net protein utilization.

6.55 DEODORIZATION AND STORAGE OF FISH, SHELLFISH, AND MEAT

Tada, Seiji
Japan 1583 (Mar. 7, 1958)
Chemical Abstracts 53, 2506g (February 10, 1959)

Bonito entrails (10 kg.) are mixed with 5 kg. of a residue from winemaking and kept for 5 days at 25° to obtain a product free from fishy odor, which can be kept for 120 days without deterioration.

Ibid. Japan 1584 (1958). Clostridium acetobutylicum is cultured for 2 days at 37° in 10 liters of medium, containing molasses 7, corn meal 1, and tap water 92 percent, respectively. The volatile products are distilled off at 90° to 100°, and the residue is concentrated in vacuo to obtain 400 grams syrup. Three grams syrup and 100 grams mackerel entrails are mixed and kept for 2 days at 25° to give a product free from fishy odor.

6.55 ENZYMES PROCESS FISH

Anonymous
Chemical and Engineering News 37, 27 (April 13, 1959)

(Abstract of this article appears under 6.132 page 13 - August 1959)

7.42 (Cross Reference: 2.9)

STUDIES OF THE RADIOACTIVE MATERIALS IN THE RADIOLOGICALLY CONTAMINATED FISHES IV. GROUP SEPARATION ANALYSIS OF THE RADIOELEMENTS IN A CONTAMINATED BIGEYED TUNA, PARATHUNNUS MEBACHI

Shirai, Kazuo and Saiki, Masamichi
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 11, 723-728 (1958) (English abstract, figures, and tables)

The ashes of liver, pyloric caeca, kidney, red muscle, and ordinary muscle were fractionated by the group separation method using carriers, and a considerable amount of radioactivity was found in Group II. Radioactive elements were proved to be mostly composed of $Cd^{113m}$ and $Cd^{115m}$.

V. Column chromatography of the radioelements in the liver of a bigeyed tuna, Parathunnus mebachi, with an ion exchange resin.--Ibid. 729-734. In the liver, $Mn^{54}$, $Sr^{90}$, and $Y^{90}$ were confirmed together with the formerly identified isotopes such as $Zn^{65}$, $Fe^{55}$, 59, $Cd^{113m}$, 115m, $Ba^{140}$, and $La^{140}$. A new isotope $Mn^{54}$, has never been recognized as a radioactive contaminant resulting from the atomic bomb tests. The confirmation of $Si^{90}$ was also carried out by the group separation method using carriers.

VI. Column chromatography of the radioelements in the pyloric caeca of a bigeyed tuna, Parathunnus mebachi, with an ion exchange resin.--Ibid. 735-737. Radioactive fraction, F1, was further examined by the group separation method using carriers, and the greater part of activity was detected in Group IIIA. The Al-absorption and decay curves of this group indicated that the isotope in this fraction was $Fe^{55}$. The isotopes in fractions, F2, F3, F4, and F7 were $Y^{90}$, $Zn^{65}$, a mixture of $Cd^{113m}$ and $Cd^{115m}$, and $Sr^{90}$-$Y^{90}$, respectively.

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